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THE AMERICAN GAS-LIGHT JOURNAL AND CHEMICAL REPERTORY.

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☞ An asterisk (*) denotes an illustrated article

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WISHING TO MAKE THIS JOURNAL an organ of intelligent discussion to those of our readers who may wish to gain or give information on the subjects to which its columns are devoted, the publishers solicit Correspondence for publication from all among them who make the study of these subjects a pleasure, or a profession.

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NEW ENGLAND ASSOCIATION OF GAS ENGINEERS.

The next Semi-Annual Meeting of the Association will be held at the Allyn House, Hartford, Connecticut, on Thursday, August 15th, 1878, at 12 o'clock, noon.

The first day and evening will be devoted principally to business, and a visit to the Works of the Hartford Gas-Light Company. On the second day an excursion by steamer is proposed, closing with a banquet.

GEO. B. NEAL.
Secretary.

Boston, July 11, 1878.

SIXTH ANNUAL MEETING OF THE AMER. GAS-LIGHT ASSOCIATION.

OFFICE OF AMERICAN GAS-LIGHT ASSOCIATION,
150 BROADWAY, N. Y. CITY.

To the Gas Fraternity of America:

The many benefits ensuing to the illuminating gas manufacturers of America, from the formation of the American Gas-Light Association, have been so clearly stated by the AMERICAN GAS-LIGHT JOURNAL, in its editorial columns, that they need not be repeated at this time.

For the information of those interested in gas-making, not members of the Association, the two following sections from the Constitution are copied:

"IV. To be eligible as an active member, a person must be a President, Vice-President, Director, Secretary, Treasurer, Engineer, Consulting Engineer, or Superintendent of a Gas Company, or an Individual Manager of a Gas Works, or a Person practically skilled in the construction and management of Gas Works."

"XXVII. Active Members shall pay an initiation fee of ten dollars, and the sum of five dollars annually thereafter, which shall be paid in advance."

CHARLES NETTLETON,
Secretary.

THE RICHMOND REPORT.

In another column will be found a letter from Mr. W. H. St. John, relating to the Richmond Report, which we gave in our last issue.

If the President of the Norfolk ges company had given us the names of the mines in Western Virginia from which he obtained his coals, we should then have been able to compare his results with those obtained from other gas works, and not be still in the dark.

Some of the coals from Western Virginia are very free from sulphur, though they do not give as good a yield in candle-feet as that obtained from the Despard, Clarksburgh, and Murphy Run.

We reckon that the latter coals are equal to any in the market for the purpose of gas making. The yield in candle feet from these coals is greater than that from the ordinary coals, and, consequently, this will make up for the extra cost of the purifications.

We may state here that results given for comparison should always be accompanied with the name of the coal used, if we are expected to form a correct judgement of the case. For with the aid of the St. John Friction, Edge Whirligig, and Smith & Farmer Zig-Zag Condensers combined, we could not purify 7,400 cubic feet of gas, with one bushel of hydrate of lime, when made from some of the coals which come into this market.

SMOKE THEM OUT.

Among the many annoyances to the manufacturers of illuminating gas may be classed the peddlers of carburetters, or so-called gas-saving apparatus; and many cities and towns, in this country and Canada, are at present infested with them.

To the consumer they promise a reduction of 75 per cent. in the amount of gas used, and also an increase in the illuminating power.

To the gas companies they offer to sell the patent-right, and leave the place for a certain consideration; but as this is generally a blackmailing operation, the company should always reject the offer at once, or else they will soon have a regular set of pensioners on their hands. For the capacity of these peddlers for invention will only cease when the company's funds and patience are exhausted.

These carburetters are generally filled with gasoline or naphtha, or some other volatile matter; and, consequently, they are liable to explode with a very slight provocation.

We would say, in regard th these peddlers, and the use of their bombshells, that the gas company whose district is invaded by them, can effectually *smoke* them all out by making a good rich gas of about 17 or 18 candle power.

To the consumers we would say that all such contrivances are useless and very dangerous; and should a fire occur through the use of them, no claim for insurance would hold good, as the use of infernal machines is not allowed by insurance companies generally.

OPPOSITION GAS COMPANIES.

In another part of our present issue will be found an article, clipped from the Indianapolis *Journal*, relating to the Lowe Water Gas Process.

In the letter from the "proud projector" of the opposition gas company, we find the same old cry of the "monopoly which has wrung millions of dollars out of the public and private funds," which has become well worn from long usage in the effort to *wring* some of those funds into the pockets of adventurers, whose forte is the puffing up of patent processes, and introducing the same with all their promised blessings.

The comments of the editor are sharp and to the point, and they are strongly corroborative of our remarks, on a similar case, given in our issue of the 2d ult.

CHANGE OF DATE.

We are requested by the Secretary of the New England Association of Gas Engineers to state that the time for holding their next meeting has been changed to the fifteenth day of August, 1878.

[From London "Journal of Gas-Lighting."]

Gas and Its Use as Fuel.

The question of promoting the use of gas as fuel for domestic and trade purposes is one that merits the special attention of all who are engaged in the manufacture and supply of that article. We therefore propose to offer a few suggestions in reference to the subject.

That coal gas possesses all the essential elements of a good and economical fuel is now placed beyond doubt. The experience of the last thirty years has proved its efficiency for almost every domestic purpose in which heat is required, and the variety of contrivances, for utilizing it in trade operations, which were brought together in the recent exhibitions at Birmingham and South Shields show conclusively that manufacturers are beginning to realize its advantages in meeting other wants than those of the household. The supply of gas for any other use than that of illumination has, however, been treated by gas companies in past times too much as a mere incident in their operations, which only under peculiar conditions and circumstances was worthy of consideration. The development of this branch of their business has also been retarded by the bugbear of day pressure, and increased leakage, more labor for inspectors, and longer columns in complaint books. These and other objections have been raised by many companies or their officials, and where decided obstacles like these have not been placed in the way, there has still been, on the part of the majority of companies, a lukwarmness and want of cordial sympathy with any attempt to promote the use of gas for cooking and heating, so that if any advance has been made in this direction, it has, with few exceptions, been due to the energy and enterprise of private individuals, either as consumers of gas or as manufacturers of gas apparatus.

It now, however, seems to be a recognized duty of all companies or corporations interested in the sale of gas, to turn their attention to the subject, and as a commercial enterprise the increase in the use of gas in this direction will, after a moment's reflection, be seen to be a matter of the utmost importance.

For several years past the value of gas property has now and then been threatened by the introduction of some new mode of obtaining artificial light—Air, Gas, New Gas, Eupion Gas, Petroleum Light Companies, and last, but not least, the Electric Light, and Jablochkoff Candle, have all in turn had their effect on gas shares, and not a few timid holders have looked with dismay upon what they feared might be the disastrous consequences, if these new luminaries should ever come into public favor. It must, however, be borne in mind that in thus judging of the influence any of the schemes might have on the value of gas investments, reference, in most instances, was only made to it as a source of light. It is true that some of the promoters of water gas have put forward extravagant claims in reference to its use as a source of heat, but a brief consideration of the impracticability of sending out mere non-luminous or heating gas at one part of the day, and carburetted or light-giving gas at night, through the same set of mains, would show that for all practical purposes water gas schemes can only compete with coal gas as lighting agents in the ordinary sense of the term. Such being the case any means by which coal gas is rendered more valuable for other purposes than those of illumination must place it in a more independent and secure position.

Taking this view, it seems scarcely necessary to point out how largely the profits arising from the manufacture of gas might be increased if the plant for the winter working could be utilized in the summer, or if the daily make of gas could be rendered more uniform throughout the year. In such a case the public would be immensely benefitted, because they would be furnished with both light and heat at a cheaper rate; and the proprietors of gas works would be benefitted, because their property would be more fully utilized, and more completely secured from the risk of depreciation by the introduction of rival sources of light.

In tracing the history of gas-lighting, there are some points which, from their significance, are worthy of attention at the present moment, and among them the fact of the small amount of actual interest displayed by companies in extending the use of gas. Manufacturers of any article which they desire should be generally adopted exert themselves to show its superiority; they spare no pains to meet and overcome the prejudices of the public and never rest satisfied until the commodity they are interested in has become an article of universal necessity. But gas companies, as a rule, have scarcely ever exhibited this desire to promote the sale of the article in which they deal. Gas was originally introduced to the public as a scientific novelty; its process of manufacture was for many years surrounded with an air of mystery; the very capital invested in its undertakings has always been looked upon as if exposed to more than ordinary risks: and any discussion of the commercial value of gas by its purchasers has been looked upon as an expression of hostility to the vested interests of the companies who supply it. It is true this exclusiveness is gradually wearing off, and many companies are beginning to see that they can afford to conciliate their customers without at all jeopardizing their material interests. Notwithstanding the enormous increase in the use of gas which has taken place within the last twenty years, still it may be safely asserted that if the companies had shown greater interest in the way in which gas was used by their customers the growth of the trade in gas would have been far more rapid than has actually been the case. The apathy exhibited by companies as to the proper employment of gas by consumers, has been the fruitful source of many of those jealousies and bickerings which have been so prevalent, and which, on many occasions, have led to bitter and expensive legal and parliamentary contests. A few pounds expended in supplying efficient burners, or may be a day or two in the month of the time of a judicious and intelligent official employed in giving information as to meters and fittings, would, in many instances, have smoothed down hostile demonstrations, and have converted foes into friends. This want of direct interference in securing the profitable employment of gas for lighting purposes by the companies who make and supply it, has been the mistake of the past; for the future, if they really desire to promote the use of gas for heating, their officers must exert more influence. It is quite certain the ultimate result will amply compensate for any time or trouble expended in directing the attention of manufacturers to what are the essential conditions to be observed in the construction of apparatus where gas is the fuel, and, on the other hand, in instructing consumers as to the kind of cooking or warming stoves best adapted to their circumstances and needs.

The Exhibition at Birmingham will, we believe, have taught some very important practical lessons to those engineers and managers who took the pains to carefully examine the articles exhibited. One very special matter was the amount of pressure required in some stoves as compared with others. In more than one instance there was an obvious deficiency of heat, owing to the absurdly small tubes and taps through which the gas was conveyed to the burners; whereas in others the pressure might have been reduced one third, and yet an ample supply of gas have been obtained. Now as the use of gas for heating purposes will mainly take place when it is to the interests of companies to have the smallest amount of pressure, it is obviously of the first importance that the manufacturers of stoves and other appliances should be so fully alive to the necessity there is so to adjust the burners and fittings as to secure perfect efficiency at the lowest possible pressure. Another important matter connected with the use of gas for either cooking or heating purposes, and one that should receive the especial attention of both the manufacturer and the gas-fitter, is that of securing ample but controllable ventilation, so that the products of combustion, as well as the vapors given off during the process of cooking, may be rapidly and effectively carried away. The want of such provision was a defect more or less observable in nearly every stove exhibited at Birmingham. It is perfectly certain that unless sufficient space be afforded to permit of the escape of all the vitiated air from the stove through a proper channel, a portion of such air will find its way into the kitchen or other apartment in which the apparatus is placed. It has been this want of proper ventilation in regard to gas stoves that has made their use objectionable in many instances. No one would think of using coal or coke in a stove or grate in which no chimney was provided to carry off the smoke and other products of combustion, so no one should attempt to fix or use a gas-stove without having taken every precaution to secure ventilation into an existing chimney, or by means of an independent pipe or flue. Not only should precautions be taken to get rid of the products of combustion, but special attention should also be paid to the character of the burner, and the supply of air to

it. An objectionable feature in many gas-stoves is that too large a volume of air is allowed to enter a stove, and only a small portion of it brought into such contact with the gas as to interfere with its perfect combustion. The disagreeable odor given off by some stoves is due to this cause. The uniformity of the size of the holes or jets, and the angle at which the flames are made to incline, are matters of some importance. In order to secure the best results in cooking apparatus, provision should also always be made for a current of air to pass under the dripping pan. The absence of this precaution frequently causes the fat or dripping to become over-heated or charred, and, as a result, unpleasant smells are produced. Too much care cannot be taken to secure perfect simplicity of parts, and facility for keeping clean, in all gas-cooking stoves. These may appear trivial matters; but just as a bad burner, or a small pipe, map convert good gas into what appears to be bad, so may the want of attention to minor details mar the success of gas as fuel.

The objection frequently urged against the employment of gas for cooking—that it may impregnate the meat or other viands with noxious vapors—has been so ably met by Mr. F. W. Hartley, in his admirable paper on gas-cooking, that it is only necessary here to refer to the matter by saying that the objection is groundless, as no such contamination can by any possibility take place, except through wilful neglect.

The foregoing remarks have had more especial reference to the use of gas for culinary purposes, but they apply equally to its use for heating generally. Full-sized pipes and fittings, low and uniform pressure, and perfect ventilation, are as essential in the heating of baths, in hall, office, or bed-room stoves, or in laundries and workshops, as for the cooking-stove in the kitchen.

Before dismissing the subject, it may be thought desirable to say a word or two upon the use of gas as a motive power. Its application to this purpose seems scarcely to have received the amount of attention in this country that its importance deserves. The almost universal employment of steam generated by the use of coal or solid fuel, has hitherto diverted attention from nearly every other mode of obtaining motive power; but it is a question that merits consideration, whether there are not many processes now carried on in which mechanical power may advantageously be applied, but where the use of steam would be quite impracticable. In such situations the gas-engine meets the difficulty. That such engines can be used with advantage, their employment in Paris, and in other cities on the Continent, is a sufficient proof. One great objection hitherto raised against them in this country, has been that they are not so economical as steam engines of equal power; but, after all, economy is only a relative term. It will be freely admitted that the cost of a pound of coal is less than that of 20 feet of gas; but the time and labor, in making proper use of the former, may eventually make it more expensive. Besides the one can only be used under very special conditions, whereas the other may be used quite apart from such conditions, and thus meet all the requirements of the case. Under such circumstances the costlier agent is the better, because it accomplishes what the other cannot. It is not, however, in competition with steam that gas engines can hope to succeed; but in cases where steam is inadmissible. There an engine propelled by gas may be perfectly successful, and on these grounds is it that the attention of manufacturers of gas should be directed to gas-engines, in order to encourage the use of such machines.

In a future article we propose to offer some remarks on the treatment of residuals, suggested by the exhibition of specimens at Birmingham.

[From Report in "London Journal of Gas-Lighing."]

North of England Gas Managers Association.

The second and final meeting of this Association, for the Session of 1877-78, was held on Saturday, April 27th. We reprint below two papers which were read at that meeting, as being of sufficient importance to merit the careful consideration of our readers.

OBSERVATIONS ON THE ELECTRIC LIGHT AS APPLIED TO WORKSHOPS, ETC.

By Mr. Ford.

The subject chosen for this paper is a pre-eminently interesting one to those professionally connected with the manufacture of artificial light, and my only regret is that the times and opportunities at my command, for the actual viewing of the electric light in operation, have unavoidably been so limited as to compel me to give but a short *resume* of what might be written on the subject, were your time not to be otherwise occupied by contributed papers on other topics.

Much has, during the last little while, been said and written about the electric light, and the probability of its partially or entirely superseding the use of coal gas and other means of artificial illumination, and many doubts and fears have been expressed and acted upon from time to time, causing relative fluctuations in the commercial value of undertakings such as those which most of us are in some way connected; but, hitherto, the *ultimatum* of each spasmodic action of this kind has been a return to the former and original value of the concerns alluded to. These periodical fluctuations may be principally attributed to the apparently successful experimental results which are from time to time brought before us by gentlemen in some cases devoting their entire time, means, and energies towards the further development of this kind of light, which has undoubtedly, by their efforts, been brought to a most wonderful stage of success. But experiments of this kind are generally conducted under circumstances the most favorable to a successful accomplishment of the end desired for the time being, and are usually wanting in many of the practical elements essential to a commercially useful and continuous application of the principles involved, so that when these principles come to be worked out in a manner calculated to be of practical utility, many failures, more or less complete, have to be encountered, and many difficulties to be overcome, before the end aimed at is reached.

This seems to have been especially the case in the employment of electricity for producing light. Many and numerous are the methods that have been tried to create, by its agency, an artificial light superior to any that was previously known, and the most successful of these has undoubtedly been what is commonly known as the electric candle, which seems to be neither more nor less than two currents of electricity communicated to two tapers of carbon, the points of which are maintained at a regulated distance, whilst the carbon particles of each taper are being consumed to create the light desired. It is not my intention to draw any invidious comparisons between the light thus created and that generated from gas coal, for such a comparison is beyond the scope of this paper; but my object is merely to give expression to some observations obtained from a view of such light in actual use in workshops of very considerable magnitude, and this I venture to do in the belief that such a sight is one of no little interest, and one which has, perhaps, not been personally inspected by all of us.

The apparatus which is used in producing the light I speak of is what is commonly known as Siemens's, and is of considerable magnitude, as the space it is desired to illuminate is extensive. There are two such in operation in different shops—one in a boiler shed and one in a fitting shop, both belonging to the same firm of engineers. The electricity required for the production of the light is generated by a powerful rotary drum lined with insulated wires, which is driven speedily round its axis by a four-horse power engine, and against this drum gently impinge fixed brushes of brass with but little friction. The mechanical force thus employed creates the electricity, which is conveyed to coils of insulated wire, and these are in course conveyed from where the generator is stationed to such position as the electric lamp may be desired to stand; in this case a distance of about 120 feet. These wires are then connected to the carbon tapers or pencils, which are about 18 inches long and half an inch thick, and are so fixed (one from the top and one from the bottom) on a delicate and most ingeniously-constructed self-adjusting instrument, called the lamp, by which the relative distance of the carbon points, when once adjusted by the operator, is maintained, checked, and regulated by the same currents of electricity which produce the light. One pair of carbons lasts about four hours, and requires to be replaced by a new set; but as the top carbon is consumed much the quicker of the two, lasting only about one-third of the time that the lower one lasts, the interruptions of the light are much more frequent and irregular than once in four hours.

The light from each of the two electric lamps that I speak of is intense in its brilliancy, and has, when looked at, a very decidedly dazzling effect on the eyes, somewhat akin to that experienced when one looks at the sun with the naked eye. The lighting portion of the arrangement is elevated a considerable distance from the ground level, in order to diffuse the light as much as possible, and to obviate the discomfort occasioned by its effect on the eyes, and the light created shines a beautiful white clear light, brighter in quality, but somewhat like in color to the light reflected from the moon at its full on a very clear night, and it gives the coal gas flames which are seen in its neighborhood a dull, yellow, candle-like appearance, which contrasts unfavorably with its clearer rival. Where the light from the electric lamp is obstructed by workshop materials or tools, a dense, dark shadow is cast behind these, and it is here that the coal gas proves its almost infinite divisibility, and is used to disperse the darkness occasioned by the brighter light, which cannot thus be subdivided. These shadows might or may possibly through time, be partly lightened by the use of reflectors, arranged in suitable positions to throw back the light, instead of having recourse to gas-jets; but it seems to me that this is in some cases almost impracticable from the fact that the reflectors would require to be continuously moved or in motion to obtain the desired effect, and, where economy in the lighting arrangement is the desideratum, this would add much to the cost of the electric light. The effect of the new light, as used in the boiler-shed, seemed to me to be more agreeable and less pernicious to the eyesight than in the fitting-shop; for, in the latter, where the fittings and tools are principally formed from polished metals, the reflection

is more severe than in the former, where the dull iron is generally used, and from the reflection from which comparatively little discomfort is experienced.

The fact of the carbon points being so quickly consumed, and requiring so much—almost constant attention, and the variability of the distance of the carbon points from each other, caused by the more or less rapid and eccentric consumption of the carbon particles—a defect which even the beautiful adjusting mechanism cannot altogether obviate instantaneously—are drawbacks against the use of this beautiful light; for as soon as the distance of the points is varied, so soon is the intensity of the light affected, and lessened or increased, as the case may be, thus giving to the light a dangerously fluctuating effect in general (which is far from pleasant), and in some cases totally extinguishing it, both faults of a very serious nature, when it is considered that, without the assistance of the constant and reliable coal gas supply, the danger, inconvenience, and expense of such irregularities as those of this electric light are such as to lead to the destruction or damage of the materials, workmanship, and tools for the guidance of which the light is intended. A supply of coal gas must also be necessary at each change—and they are frequent—of carbon points, unless the place could afford to be in total darkness whilst the operation is being conducted, or a second electric lamp be fixed, to work whilst the first is having its carbons rearranged.

The lamp, properly so-called, is, in itself, as I have said, a most ingenious automatic arrangement, very delicate in its action, and therefore liable, one would think, to get out of order; certainly it takes a deal of attending to while in operation, and requires almost constant watching.

It may be well for me to mention here that the two electric lights alluded to in my observations were not brought into use with a view to economize coal gas, nor have they tended towards such a result. The object aimed at was the clearer illumination of the area enclosed by the buildings, and in this respect they seem to answer admirably.

I hope on some future occasion to enter more fully into detail as to the comparative cost, utility, convenience, and physical effects of light from coal gas, as compared with those of the electric light; but on the face of observations such as those I have had, it seems clear that the light given by electricity as much transcends the quality of that produced from coal, as do the indefinite divisibility, cleanliness, and ease in application of coal gas exceed these attributes as applied to the electric light.

ON CONDENSATION.

By R. Smith.

In the early history of gas-lighting we read but little about condensation, although it was then, as it is now, an essentiality of gas manufacture. From the time gas was first used for artificial lighting until now, many forms of condensing apparatus have been devised, and many alterations and improvements have been made; but I do not think even yet that this particular part of purification has received the amount of attention that it deserves. It has often been asserted that "good condensation is half purification." Well, it may not be quite half purification, although it plays a very prominent part in the process of gas manufacture, and is worthy of receiving that amount of attention which it does not receive. Certainly, in the process of condensation, the gas is not cleansed of the sulphuretted hydrogen or the sulphur compounds, condensation being a mechanical operation, but it is separated from the tarry and watery vapors which it contains, and reduced to that temperature which makes the other processes of purification more easy. If by imperfect condensation and cleansing the gas from tarry and watery vapors, as by imperfect purification from sulphuretted hydrogen, the gas was sent impure to the consumers, a much greater interest would be taken in it; still if, by imperfect condensation, gas containing sulphuretted hydrogen is not sent to the consumers, but tends to decrease the prosperity of a gas concern, is it not as much our duty to favor the employer as to favor the consumer, and does it not bring with it a greater amount of satisfaction to ourselves? Condensation is the first process of purification, and if it be defective, the other processes will be defective, because they are directly and indirectly connected with, and influenced by it. The question now arises: What is good condensation, and how is it to be arrived at, and what advantages arise, from having a sufficient and proper arrangement of condensing apparatus? I do not propose entering very fully into this subject, but I trust the few remarks I do make will not be devoid of interest.

The tarry and watery vapors present in the crude gas will condense somewhere, and where can this be better done than in the apparatus constructed for that purpose; but if it be insufficient or incapable of doing so, the scrubbers or washers, purifiers, and street mains will become condensers, which certainly is anything but pleasant or profitable. The condensers are intended to cool the gas to a certain temperature, and cleanse it from the tarry and watery vapors which it contains in its crude state, and, to perform this work thoroughly and well, they must be of sufficient capacity and construction so as to reduce the gas to its lowest temperature, and at the same time remove these impurities before the gas has issued from them. If condensers cannot perform this work, it is a waste of money in having them erected at all. It is estimated that the temperature of coal gas in the retort does not exceed 135°, and this must be gradually and regularly reduced. The gas in the first and second columns of the condensers is often reduced about 25°, whereas the remaining columns, six in number, will not reduce it 20°. There is no regularity about this, and I would suggest that the columns be regulated to make—or as nearly as possible to make—the reduction at this ratio, viz.—

Gas enters at, say: 100°. First column, 96°; second column, 90°; third column, 83°; fourth column, 72°; fifth column, 62°; sixth column, 55°; seventh column, 51°; eighth column, 49°.

The lowest temperature to which the gas is exposed will be rather under 49°, but it is better to be under than over condensed, because in the latter case there is danger of depositing the hydrocarbons, and, consequently, damaging the illuminating power; also danger of depositing naphthaline in the main and service-pipes; and how often are the inlets and outlets of our gasholders choked up by this naphthaline, or "salts," as it is generally called.

It is a very difficult matter to have condensation perfect, because of the great irregularity in the quantity of gas manufactured, and the variation of the atmosperic temperature, but I believe it might be a great deal nearer perfection than it presently is, and the nearer it is to perfection, the better will be the result financially.

A great many different arrangements are put forward, by their own advocates, as being competent to perform this task of condensation efficiently.

We have, for instance, the battery condenser, the underground condenser, the horizontal condenser, the annular condenser, and the water channel condenser. The last two mentioned are looked upon with more favor than the others. In the water channel condenser, I believe that the gas is cooled too quickly—that is, if the water can always be kept cold. Hughes says: "Where the gas has an excess of temperature of 10° over the atmosphere, a unit of surface which would radiate eight parts of heat in the open air, would, in water, radiate no less than 88 parts," or "where the gas has has an excess of 30° over the atmosphere, a unit of surface which would radiate 29 parts of heat in the open air, would, when plunged in water, radiate no less than 5353 parts of heat." This certainly shows the superiority of water as a cooling medium, but I believe that gas is not wanted to be cooled in such a hurried manner, and on this account I do not think that the water channel arrangement of condensation will ever attain a great standing as a condensing medium, and more than this, no matter how the water may be regulated, and put in or drawn off the cistern that contains the piping, no matter how many division-plates are fixed to regulate the flow of water against the flow of gas, the temperature will not be reduced proportionately, and it is impossible, under such circumstances, that good condensation can be effected.

The annular condenser has attained a greater standard than the water channel condenser—indeed, than all other condensing arrangements—although I believe it is deficient, because the current of air is equal in the inlet column to that of the outlet column; the result being that the gas is lowered too quickly in the first column, and reduced to its lowest temperature not proportionately. I believe it would add to the efficiency of this condensing arrangement if the first and second columns had no inner cylinder, or if the current of air was regulated at the top and bottom of each column, and this could easily be arrived at by placing small doors or covers of such construction that they would act as dampers, and so regulate the draught as necessitated by the temperature of the gas and atmosphere. A thermometer would be required for each, or every alternate column; but the process of cooling and cleansing the gas from the tarry and watery vapors would go on smoothly, regularly, and efficiently. This condensing apparatus is subject, like other condensing arrangements, to become choked with tar, and sulphates, unless there be some preventive, and it is rather awkward getting them cleaned out., especially in the winter months; and when there is no bye-pass, and while they are being repaired, the gas passes onward to the scrubbers and the purifiers without being condensed at all. Now, it is a very easy matter to have a steam-pipe connected to the end of every fourth or fifth column: open the tap occasionally, the steam is carried along with the gas; the temperature of the interior of each column is raised, say, 30° over the ordinary temperature, and the tar and sulphates are deposited in the bottom box. We have this arrangement in Darlington, and are never put to inconvenience by foul condensers, and have always the same area of cooling surface. I am aware that a number of Managers have adopted this system of cleansing by steam; but a good thing is none the worse for being told over again, and, perhaps, there may be a few who have not considered the advantages of it, and I believe that, when a condensing column has an internal coating of one

inch, its action is greatly impaired, and if it be allowed to grow much over that thickness, it is a condenser in name only. not in action, because the gas is robbed of the cooling influence of the atmosphere.

A great difference of opinion seems to prevail as to what quantity of surface is necessary for the proper condensation of gas; but it is generally considered that 150 square feet of surface is required for every 1000 cubic feet of gas manufactured per hour. I do not consider this a good criterion, or a rule to be depended upon, because a great deal depends on the temperature of the retort, the position of the hydraulic main, and the length of piping through which the gas passes before entering into the condenser. Another consideration is the coal that we use. Clegg says: "Some kinds of coal require greater condensing power than others. The coals from the Midland counties, for instance, yield twice the quantity of aqueous vapor that Newcastle coal produces during distillation." So we may be satisfied that it matters little how many feet of surface we have to bring the gas in contact with; if it be not properly applied, good condensation cannot be effected. If the cooling influence in the first column is as great as in the last column, how can the gas be properly cooled and condensed? If the gas issues from the last column of the condenser at a higher temperature than that to which it will be exposed, or, if it enters from the last column at a temperature of, say 65°, and enters into the first scrubber or washer, which shows 60°, how can the gas be properly cooled or condensed? Consequently, the scrubbers are unable to perform their part of the purification, because the gas does not enter into them properly cooled; and if not properly cooled, not properly condensed from the tarry and watery vapors, and the purification of ammonia is impaired. If the gas enters the purifiers at an excess of temperature, the lime also loses its affinity for removing the carbonic acid, and we know that carbonic acid is not only uninflammable, but it instantly extinguishes flame even when diluted with three times its volume of air; so it is essentially necessary that this impurity should be at least partly removed from the gas, and we know, from various authorities, that its presence, only to the extent of one per cent., will diminish the illuminating power of coal gas fully five per cent.; and, more than this, if the purifying lime is made hot by the gas, it very soon becomes hardened up, and requires to be taken out before being fully saturated with sulphuretted hydrogen; otherwise keep on working for a day or two against a crushing back-pressure. But even taking it for granted that 150 feet of surface is sufficient, when properly applied, we must have the condensing apparatus divided by valves, so that in the summer months, when the make of gas is at its minimum, the gas will not pass through all the columns, but have only, or as near as possible, the same area of 150 feet; although I believe that, in any case, it is advantageous to have the condensing apparatus divided, so that we can have more or less cooling surface as necessitated by the variation of circumstances under which we labor.

The principal—in fact, the only argument advanced in favor of underground condensation is that, by keeping the gas in contact with the tar, the illuminating power would be increased; but if this does increase the illuminating power, it could be equally well performed by placing pipes along the interior of the retort-house wall, where the temperature is nearly always equal, and where tar will always be found in the pipes, and at a temperature that would not condense the hydrocarbons, which, however, would be the case, and especially at the end pipes of the underground condenser. It has been asserted that while the temperature of gas is being reduced from 120° to 110°, it is enaiched with the volatile contained in the tar, but if it be kept in contact with the tar after this, and while being further reduced in temperature, those oils drop off or are condensed.

From this we can infer that the retort-house piping is a capital system of condensation, and much superior to the underground condenser, so far as keeping the gas in contact with the tar, as a means of increasing the illuminating power, is concerned, because where the one is defective the other is efficient—that is to say, tar at every temperature will not give off the volatile oils, and while it would give them off in the retort-house it would not in the underground condenser.

Of one thing, however, we are satisfied, and that is, that the tar should not be carried any further than the condenser, because, if it is, in addition to decreasing the illuminsting power, it will gradually close the gas passage in the scrubbers or washers, and tar having an affinity for naphthaline, a total stoppage will naturally follow, and the apparatus require to be put out of use, and, perhaps, when it can be least spared; certainly, if a current of water or ammoniacal liquor is kept constantly flowing through these vessels, the tar and naphthaline may not be deposited there, but especially in small works, water or ammoniacal liquor is seldom passed through the scrubbers. Mr. R. H. Patterson, ex-gas referee, speaking on this subject, says "One disadvantage of tarry matter being allowed to pass forward from the condenser is that the tar chokes up the interstices in the coke or brick scrubber, so that the gas, instead of ascending equally through all parts of those scrubbers, forces a passage upwards by comparatively few routes, and thereby does not come in a proper manner in contact with the purifying water." Also, "The water or liquid in the scrubbers is raised above the ordinary temperatures, whereby its power of absorbing ammonia is lessened, while at the same time the liquor from the scrubber, gives off into the air, a larger portion of the ammonia which it contains than it would do at a lower temperature.

From this we can infer that if the ammoniacal liquor is made warm by the gas not being properly or sufficiently cooled in the condenser, its power of absorbing ammonia is lessened, and the gas goes to the consumers containing that impurity. It may or may not be detected, but one result is certain, and that is, the brasswork of some hundreds, perhaps thousands of meters, and the fittings of dwelling houses, are being eaten up. While this is taking place outside, the apparatus inside is foul and there is little or no gas passage. The engine and exhauster are battling with a heavy back pressure, which means a greater consumption of fuel; the rich illuminants are being partly deposited, a less quantity of gas is obtained from a given quantity of coal, and, as a matter of result, bad returns.

So if good condensation is not half purification, it certainly plays a very prominent part in the half-yearly balance-sheet. If inefficient condensation brings with it such serious results, is this subject which I have taken up not worthy of receiving more attention in the future than it has rereived in the past.

A Metal that is claimed to expand in cooling is made of nine parts of lead, two of antimony and one of bismuth. This metal is said to be very valuable for filling holes in castings.

The Lowe Gas Process.

A Screed from the New Gas Company.

To the Editor of the *Journal*—

"In your issue of the 9th instant I find the following editorial comments, which are so entirely void of truth, and so evidently intended to manufacture public sentiment against the new gas company and assist the old company in destroying the new and again placing this city in the control of a monopoly that has already wrung millions of dollars out of the public and private funds of this city, therefore I am constrained to take public notice of your article, and ask a publication of this answer and denial of the charge insinuated.

"'We think in time it will gradually creep through the minds of our own alleged fathers that the new gas company here started out to levy upon the old company, and not to furnish cheap gas, and that they have succeeded by the aid of the Council in doing just what they started out to do, and, having obtained one contribution by a forced purchase of a part of their stock, they now come back and ask, by means of the suit, to force another contribution.'

"In answer to the first insinuation I would say that it is but a repetition of the charges made by the tools of the old company, in Council and elsewhere, at the time the granting of a charter was under consideration—'that it was a blackmailing scheme;' 'that there would never be a brick laid or a pipe put down,' etc.

"The writer of this was the projector of the enterprise which resulted in the building of the new gas works, and I wish to say to you and the people of Indianapolis that the enterprise was begun for the purpose of giving to the city and the citizens of Indianapolis gaslight at a greatly reduced price, and at the same time afford a safe and profitable investment to those who would build it, and any insinuation to the contrary is wholly and maliciously false. Previous to, and after the granting of the charter, I made most strenuous efforts to interest home capitalists in the enterprise, but owing to the extreme stringency and unsettled condition existing in commercial affairs, and the tremendous influence of the old gas company through its four banks (which influence they lavishly used), they succeeded in breaking every combination that was attempted to make a strong home company. Notwithstanding all this we organized a company, and poor as it was went forward with the work until the means at hand were exhausted, still hoping to induce home capitalists to take hold. Failing in this we were compelled to seek aid abroad. Well, the works have been built. The city of Indianapolis was not asked for a subsidy or to furnish bonds or money to do it. Hundreds of idle laborers and mechanics were furnished remunerative employment, and they all received their pay.

"Was this worth anything at a time when your paper was full of accounts of the meetings of idle laborers who were demanding bread or work to earn it? Has the main object intended by the chartering of the new company been accomplished? Previous to the starting of this enterprise the net price of gas in this city was three dollars per thousand. The president of the old company stated through the press of the city that it could not be offered for less. The City Council sent committee after committee to ask some rebate to the enormous bills of the city, but without effecting anything.

"The present price of gas is two dollars per thousand. This is a reduction of 33⅓ per cent.; or, placing, the average consumption of gas at

500,000 feet per day, it aggregates a saving of $182,000 per annum. Is this worth anything to the gas consumers? I will venture the assertion that no enterprise ever started in this city has been of so great a direct benefit as the establishment of the new gas company, and while I may eventually be robbed of the fruits of nearly three years of hard work and the investment made, they cannot rob me of the proud satisfaction of having been the projector of an enterprise that shall be of so great a benefit to my fellow-citizens. The balance of your article regarding the suit in progress I would respectfully refer to Judge Harlan.

C. J. Brackebush.

The foregoing defense of the new gas company is given with the desire to treat the parties connected with that enterprise perfectly fair. It does not change the facts or the history of the transaction in the least, and these facts are by no means creditable to any one connected with the transaction. The admitted or established facts are briefly these: The men engaged in the enterprise were adventurers who go from city to city making money for themselves by threatening competition and compelling a purchase by the established companies. They brought no money with them, and whatever they carried away was made off of some one belonging to the city. The organization was a skeleton, no money having been paid upon the stock. The zealous defender of the company had no interest in it except the stock given to him for his services in roping others into it.

The streets of the city were torn up and left, and are today in a damaged and unrepaired condition. The reduction made in the price of gas is no greater than the reduction made in other years before the new company was organized, and the new company was the one that maintained the price at $2, and insisted on an agreement with the old company, maintrining what our correspondent is pleased to term a monopoly. The sale was made in the face of the bond given to the city that it would not be made, and the leaders in this honest enterprise are now repeating themselves in other cities. Our correspondent may think these are square business transactions. We do not think so, and so stated. The whole transaction is a strongly-marked case of Peter Funk from beginning to end, and the only misfortune is that the city allowed itself to be dragooned into giving it vitality.—*Indianapolis Journal, July* 12, 1878.

On Steam Boiler Explosions, and Experiments Relating Thereto.

By Dr. Hermann Scheffler.

The author is disposed to refer many boiler explosions to the creation of a marked disproportion between the external pressure acting on the boiler water and its internal temperature. This may act in two ways: (1) as a primary cause of explosion where the taking off of the pressure produces a sudden and violent generation of steam, the shock of which is greater than the boiler can withstand; (2) as a secondary cause where a rent in the boiler produced by some other means creates the disproportion, and the ensuing generation of steam comes in to render the explosion much more violent and destructive. The second fact is generally admitted, but as to the former there are great differences of opinion, and it is therefore desirable that the point should be cleared up by actual observation on the fluctuations of pressure and temperature occurring within steam boilers under various circumstances.

With this view the writer affixed three thermometers, made specially for the purpose by Messrs. Schaeffer and Budenberg, to different parts of the boiler of a locomotive, viz., one in the front of a boiler, close to the entry of the feed-pipe, and, therefore, where the lowest temperature might be looked for; the second about the middle of the length of the fire-tubes, where the temperature would probably be highest; and the third in the front of the fire-box and near its top. A large series of observations were taken of these thermometers by competent persons, and at short intervals. The results are embodied in a table which gives for each observation, (1) the actual pressure at the moment as given by the pressure gauge, in atmospheres; (2) the readings of each of the three thermometers: (3) the theoretical pressure of steam corresponding to each of these temperatures, as calculated by the formula of Regnault. The observations fall into four groups according to the following condition:

(A) engine standing, feed shut-off: (B) engine standing, feed going on: (C) engine running, feed shut off: (D) engine running, feed going on. Separate series of observations were also taken when the pressure was rising, and again when it was falling.

The pressure as given by the gauge in every case differed from the theoretical pressure deduced from the temperatures. As these latter always varied among themselves, exact agreement was of course impossible; but this was not enough to account for the differences observed, which may possibly be attributed to defects of the gauge, but should rather be taken into account among the general results of the experiments. These are as follows:

(1) When the feed was shut off, whether the engine was standing or running, the thermometers at the fire-box and in the middle of the boiler gave very nearly equal readings. At the smoke box end the temperature was somewhat lower, but the difference was not above 5°.

(2) With the feed shut off, but with rising temperature and pressure, the indicated tension of steam in the steam-space was about 0·2 atmosphere (3 lbs.), higher than the theoretical pressure at the hottest part of the water; with falling temperature and pressure it was about as much lower.

(3) When the feed was opened the temperatures at the three places fell unequally; the fall being least in the middle, greater at the fire-box, and greatest at the smoke-box near the entry of the feed-pipe.

(4) Where the feed was effected by an injector these differences were least, not exceeding 7°; with a single pump they amounted in some cases to 9½°, and with two pumps to as much as 17½°, corresponding to a difference of pressure of 2½ atmospheres (about 35 lbs.).

(5) A fall in the temperature of the water was in all cases followed by a fall in the tension of the steam; but when the cooling was rapid this fall was less in proportion to it, so that the actual tension became higher than the theoretical pressure at the points of observation. The greatest difference so observed amounted to two and three-quarter atmospheres.

(6) While this held in general, there were cases where, at the commencement of the feed, the theoretical pressure at the hottest point was for a short period higher than the actual steam tension, the greatest difference, however, not exceeding 0·43 atmosphere,

(7) When the injector was used the temperature of the feed-water, immediately before entering the boiler, was from 40° to 60° higher than that of the tender-water. This, of course, accounts for the inequalities of pressure produced by an injector being much smaller than by a pump.

(8) A sudden opening or closing of the regulator produced an instant fall or rise of the pressure gauge of about 3 lbs., or 1½ lbs. respectively, followed in general by a slight recoil towards the original standpoint.

(9) The opening of the regulator caused a rapid fall of the thermometer which at that moment stood highest, and a rise of that which stood lowest, amounting in each case to about 3½°, thus producing an equalization of temperature to the amount of about 7°.

The following general conclusions are drawn from the above facts by the writer:

(1) The supply of water by feed-pump causes large variations of temperature in the different parts of a boiler. These act on the steam tension, but with the general result that this tension is decidedly in excess of the theoretical pressure due to the water temperature; thus fortunately tending to retard, and not to accelerate, the generation of steam.

(2) At the first moment of opening the feed the converse is observed, the steam tension being about 0·4 atmosphere in defect of the theoretical pressure. The same holds to a smaller extent when the feed is shut off, provided the temperature and pressure are falling at the time.

The explanation of the above facts is obvious. When the pressure is lessened by the steady abstraction of steam it falls steadily both in the water and the steam space. When the abstraction is rapid (as with steam blowing off) the water maintains for a time a higher temperature than the steam space, with a corresponding generation of steam. When the pressure is lessened by actual cooling of the water, the steam only follows it gradually, and keeps up for a time a higher tension. The slight converse effect, at the moment of opening the feed, is accounted for by the additional consumption of steam due to the feed pump, and perhaps by a slight condensation of steam effected by the first entry of the cold water.

(3) When the temperature and pressure are rising instead of falling, the steam tension will similarly appear in excess or in defect of the theoretical pressure, according as the original cause of the rise is a checked consumption of steam or a more rapid generation. The first case is shown in the experiments when the engine was standing, the second on several occasions when it was in motion.

(4) Wherever pressure is taken off water, which is above the boiling point, a sudden generation of steam must ensue. This has been actually observed in the experiments to take place to the amount of ⅓ atmosphere under ordinary conditions. In exceptional cases it might be much greater, especially when the large differences of pressure at different parts of the boiler (sometimes amounting to thirty lbs.) are taken into account. The sudden spring of the pressure gauge at the opening and shutting of the regulator indicates the violent effects which rapid changes of this kind would produce in a mass of vapor at high tension. The author thus considers himself to have shown that under a rare but not impossible combination of circumstances, a sudden generation of steam might occur violent enough to burst, if not a new boiler, at any rate one deteriorated by long working. At the same time the much slighter effects of this kind produced by an injector, as compared with a feed pump, should be noted as forming a substantial advantage on the side of the former.—*Van Nostrand's Engineering.*

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FRIDAY, AUGUST 2, 1878.

Official Report of Examinations of Gas for two Weeks ending July 27, 1878, made at the Photometrical Room of the Department of Public Works.

Corrected Illuminating Power.

July 1878.	Time of Day at which Test were made.	New York Gas Light Co.	Manhattan Gas-Light Co.	Mutual Gas-Light Co.	Metropolitan Gas-Light Co.	Harlem Gas-Light Co.	Municipal Gas-Light Co.
15		17.03	16.04	20.69	16.55	15.66	
16	Between	16.24	16.15	22.40	17.45	16.51	
17	9 A. M.	16.52	16.29	20.77	17.48	16.34	
18	and	16.25	16.88	20.99	18.35	17.91	
19	12.30 A.M.	16.23	17.06	19.25	18.33	16.18	
20		16.66	16.85	20.38	16.85	15.83	
	Average	16.48	16.54	20.74	17.50	16.40	
22		16.87	16.44	20.00	18.45	17.15	
23		16.46	15.88	20.70	17.58	16.05	
24		16.70	16.32	20.28	17.57	16.70	
25		16.40	15.90	19.78	18.30	16.65	
26		16.10	15.74	19.16	17.68	16.20	
27		16.28	16.16	20.30	16.88	16.65	
	Average	16.43	16.07	20.03	17.73	16.56	

Sugg-Letheby burner.
E. G. LOVE, Gas Examiner.

Kerosene Lamp Explosions in Pittsburgh.—Five explosions of kerosene lamps causing fires, and sixteen such explosions not resulting in loss by fire, are recorded during the year. The fire marshall calls attention to the very inferior quality of much of the petroleum oils sold in Pittsburgh, and says that fully two-thirds of the explosions mentioned should be called "benzine explosions."

[From "Journal of Gas Lighting."]

British Association of Gas Managers.

The Fifteenth Annual General Meeting of the members of this Association was held in London, on Tuesday, the 18th, and Wednesday the 19th ult., at the Rooms of the Society of Arts, John street, Adelphi, CORBET WOODALL, Esq., M.I.C.E., the President, occupying the chair.

TUESDAY, JUNE 18.

The PRESIDENT took the chair at 10 o'clock this morning.

The minutes of the last general meeting, and the statement of accounts, which had been previously printed and circulated, were taken as read and confirmed.

The PRESIDENT then proceeded to read the following

INAUGURAL ADDRESS.

Permit me, before proceeding to the business of our meeting, to express my cordial thanks for the honor you have done me in electing me to this chair. I regard the position of President of the British Association of Gas Managers as the highest open to members of our profession, as such, and I value accordingly the confidence you have been pleased to repose in me.

I occupy the chair this morning with much of personal misgiving, but with strong confidence in your generous help. I earnestly hope that this may prove not the least interesting and profitable of the gatherings of our Association, and that throughout there may be manifested a vigorous interest in the matters under consideration, combined with perfect harmony and mutual respect.

I have felt for several years past that the time at our disposal for these annual meetings is too short; very soon I hope it may be possible to extend the three days to at least four. In the meantime, in order to get the maximum of advantage out of our short session, it is necessary that all the time possible should be given to the papers and discussions, and it is to this end especially that I shall need to ask your watchful and constant co-operation. Our formal and official business must necessarily occupy some rather considerable time; but I venture to suggest not so much as it has occasionally done. I hope also that gentlemen who propose speaking on any particular subject will immediately avail themselves of the first opportunity for so doing.

It is very gratifying to observe the continued growth and prosperity of our society. The success which has attended it throughout has been remarkable and uninterrupted, and our numbers have increased so rapidly that we shall soon be shut out from the possibility of obtaining more recruits, because all the men will have been enlisted. We find also less difficulty in obtaining papers; the quality of the communications is fully maintained, and our discussions become more general.

Our muster-roll is such as few scientific or technical societies can point to, as the growth of so short a period, and it is one of which we may be justly proud. At the same time it puts upon us an obligation to furnish fruit worthy of so fair a tree; for a crop that would be creditable to a young vine in its early days, would be unworthy of it when a dozen years in passing had helped it to maturity of strength and vigor.

Of the fruit already borne, not the least important, in my opinion, is the foundation, in various parts of the kingdom, of district Associations, with objects similar to our own.

Our Society is perhaps young to undertake the cares of maternity; but a mother she is, and that of a rather large family. The anxiety of the parent is less than it might have been, because the children are so remarkably strong and healthy—indeed, they remind one of that prodigious birth recorded in classic story, when Minerva issued full-armed from the brain of Jupiter, rather than the ordinary and prosaic method, so little have they manifested of the dependence and weakness of infancy.

That these Associations may prosper abundantly we all truly hope. They have one material advantage in being able to meet more frequently than is possible with us, the members having to be drawn from shorter distances. These more frequent meetings not only give time for more careful consideration of the subjects brought forward, but they also tend to the formation of friendships, most useful and pleasant, among men who, though living near each other, might, without such aid, remain as perfect strangers as next-door neighbors are supposed to be in London.

As to the influence of these Societies upon our own, I entertain no fear that it will be anything but favorable. The stronger the individuals become, the better for the body in which they are united. The one evil that occurs to me as possible is, that members, finding it impossible to prepare two papers, may give preference to local claims, and we may run short in consequence. This is not likely, but to put it out of question altogether, I would suggest that each District Association should charge itself with the responsibility of furnishing from among its members at least, one paper annually to the parent Society. If this suggestion be adopted, not only shall we be sure of abundant matter, but there will be an element of friendly rivalry introduced that must have a beneficial influence on the quality.

Some concern has been expressed on recent occasions at the fact that our financial balance has slightly diminished. Although the accounts of the past year show an improvement in this respect, yet it is not a considerable one, and I venture to ask that there may be a still larger response to the invitation given by our past Presidents, that such members as can afford it will increase their subscriptions to a guinea. I do not ask this on the ground that it is desirable to increase our reserve materially, but because we should be lifted beyond the necessity of discussing reduction of useful expenditure, and because also we have by no means reached the limit of profitable spending. This is a matter that has never caused me the least concern, because I know that we all feel too deep an interest in, and affection for our Society, to allow it really to suffer on this ground.

Looking at the enormous importance of the gas industry now, it is hard to realize that the generation which saw the incorporation of the first gas company has not yet passed away. (Our astonishment is not diminished but increased, when we remember that the same is true of the railway system, and many other of the great industries giving employment to the Civil Engineer.) Year by year, with steady strides the demand for gas has advanced, and with it the demand for gas makers. In the earliest days of gas lighting men had to feel their way step by step, and many years were occupied in bringing the manufacture to anything like a complete system. For a long time the business of gas-making was regarded by the general public as something secret and mysterious, and the management was in the hands of a very limited number of men. By degrees, however, this condition of things has been altered, and the study of the construction and management of gas works is as open as any other branch of engineering to whoever chooses to enter upon it.

I make these remarks because I wish—treading in the steps of several of my predecessors in this chair—to draw the attention, especially of our younger members, to the growing necessity for thorough preparation on the part of those who are to follow, and obtain success in the profession of gas engineering. I say nothing on the question of early education; that is a matter over which the student has usually little control. Happy is he whose parents are able and willing to afford him a good one; for the youth whose mind has been trained to concentrated and systematic work, starts with as great advantage over one so fortunate, as in a race a public school athlete would have over a ploughboy. But it is after school has been left behind, and actual work has commenced, that a man's training frequently begins. Under the spur of felt necessity, of active competition, he can do much in

his hours of leisure to fit himself for a successful career, and under such stimulus the ploughboy does sometimes come to the front. But remember, gentlemen, it is not as the ploughboy. The men who "make their own way," in spite of early disadvantages, do so at a cost of labor and toil out of proportion to what it might have been, and honored should they be in the same degree. All such men put a high value upon early training, and readily admit that they would have been the better for it. The early years lost cannot be made up for; duties and responsibilities grow and a man finds his time fully occupied in meeting these, and none left for catching up arrears. I readily admit that this has always been the case. What I urge is, that the question of training becomes year by year of greater moment; "rule of thumb" less possible; and to quote a remark of Mr. Bruce Bell, "an educated engineer is as likely to succeed as an uneducated schoolmaster."

In our case, the growth of the business of the companies involves the necessity for works of constantly increasing magnitude, and this again brings added responsibilities in management and control, as well as the necessity for further acquaintance with the principles of construction, while the demand for refinements of purification, coupled with the obligation to avoid offence on the works, makes still further demands on the care and ability of the manager.

Then also the Legislature has from time to time, as natural development of our industry and the improvements and economies effected by the companies have rendered it possible, reduced the maximum price chargeable for gas; every such reduction making it more imperative that those interested with the management should be alive to the progress effected, should know what is being done by others, and be capable of comprehending and applying for themselves processes which tend to improve or cheapen production, and thus to the advantage of their employers and the public. In short, gas-making is in the same category with all other great industries of a scientific nature in this respect, that year by year the demand upon those who conduct it, for increased intelligence and skill, becomes greater; while the steadily improving character of the general education of the country causes the race to be keener and the competitors to be more in number for the prizes which it has to offer.

To help us carry forward our profession, at least in line with the general progress around us, is the mission of this Association, and although it cannot take the place of individual effort, it can, and does, worthily second it.

If such is the work of our Society, it has an interest and a value to gas companies as well as to ourselves, and I am very glad to know that this is now widely recognized. I would strongly advise all members who are managers of works to make a point of specially reporting to their Comimttees or Directors upon the work done at each of our sessions. In this way an intelligent interest in our proceedings will be maintained, and employers will see that the money spent in paying their officers expenses to our meeting is well invested.

The subject of remuneration is one that I feel we can do little good by discussing here. It is one to be settled by the two parties to the engagement, and will be governed, to a large extent, by the law of supply and demand in the first piece, and by the proved value of the officer himself subsequently. There is one aspect of the question, however, upon which, with your forbearance, I will say a few words.

In the Journal of Gas-Lighting, No. 715, appeared the following remarks:

"It seems to be a common belief that all gas officials are highly paid, but no grosser delusion ever prevailed. There are a few, very few, who receive well-earned, large salaries: but we repeat, without fear of contradiction, that a vast majority of gas managers are most inadequately rewarded. They are required to know something of many arts, and several sciences. They can hardly be said to have peace night or day, and, at times, their duties are of a most onerous character: and when they have done all, they often receive less than a banker's or a merchant's clerk, who has only to make entries and add up figures from ten to four o'clock. Struggling companies may have some excuse for parsimony; but, if we might select some of the worst cases of inadequate payment, we should take them from our corporate towns. Here, too, it may be said, there is an excuse, for we have recently read of indignation meetings being held to remonstrate against the addition of £50 a year to the salary of a most valuable gas officer.

"We feel bound to insist on this matter, for, in our opinion, it lies at the bottom of all the mischief of which complaint is now made. Pay a man well, and then you may expect or require him to be immaculate. It is, from a moral point of view, sad to think that men require to be bribed, as we might say, to be honest; but such, in a limited sense, is the fact. You must place men above temptation before you can expect them to resist it."

This, as many will remember, formed part of an article dealing with the question of the payment and acceptance of commissions, which had been raised in the columns of *The Times* and other papers, and was continued in the Journal. I refer to it here from a conviction that the subject is one that materially affects both our reputation and our prosperity. That inadequate salaries justify the acceptance of commissions no one here will, I think, maintain; but that they increase the temptation cannot be questioned

I wish, however, to point out that, while small salaries tempt to commissions, commissions tempt to small salaries. It does happen, and will continue to happen so long as the system remains at all, that some men will be found willing to accept duties at inadequate remuneration, purposing to make up by this means, while those who decline commissions have to be content with such salaries as would be accepted by the former class. The restriction of salaries is not the only wrong the system does, for it brings undue suspicion on those who do not join in it, and makes possible wholesale charges of a most unjust nature.

The acceptance, by a paid agent of a principal, of fixed or more or less well understood per centages on the values of goods purchased, or contracts made, is as morally indefensible as any system of bribery, and yet who does not know how plausible are the arguments used by those who offer them? It is pleaded that they are only a deduction from the profits, and no loss to the principal whose agent receives them. But I would ask, supposing these payments to be abolished, by what special arrangement of political economy would competition be prevented from reducing prices by their amount?

In a leading article in *The Times* of the 6th inst. appear the following passages: "The practice of receiving commissions has been pronounced illegal in every way, and this in terms which will make it impossible for any man to meddle with it with a notion that he can be acting honestly. A usage, however prevalent, which is declared to be corrupt in itself, and opposed to common morality, must be held to go far beyond the doubtful border-line at which impropriety begins. The man who can receive a commission, and not be biassed by it, who can form as independent a judgement as if he himself had no personal stake in the matter, and can look after his employer's interests as sincerely as if he had not been paid for betraying them, must be so rare and so superhuman an exception, that the Queen's Bench Judges were fully justified in not enlarging the law on his account. It is obvious, too, that to one side or the other a commission must be unjust. If the receiver of it does the work he is paid for, it is his principal who will suffer. If he takes it and does nothing for it, it is hard to see what sort of defence he can make for putting it, thus unearned, into his pocket. But, whatever the exception may be, there is no doubt as to the rule which will hold good in ninety-nine cases out of one hundred, if not in the hundredth too. His judgment, if he cares to think about the matter at all, will be influenced in the way intended, and he will give advice which is not the best, or will accept terms which are less favorable than they might have been. The arbiter who receives a bribe is not held to be excused, even if he can make out that he has remained indifferent in spite of it. There was a breach of trust committed in the mere receiving it, and it is idle in such a case to speculate on what the after consequences may or may not have been."

I must ask your indulgence for entering on a subject so delicate, and in many ways distasteful. I have done it because I felt that to pass it by was the graver fault.

I know that there is no special reason for addressing such observations to gas managers, more than to any other body of commercial or professional men. I know also that the statements that have been made as to the general prevalence of the custom are gross calumnies; but so long as commissions are offered and accepted, I think it our duty to protest against them. That many employers lend themselves to the practice they condemn, by paying salaries below the value of services rendered, there can be no doubt; that some even wink at the custom, as justifying them in such a course is, I am told, a fact. But no such circumstances make it one whit less objectionable; they do but show more broadly its pernicious effect. I have never heard other than one opinion expressed on this matter by managers or manufacturers, and that of directors can admit of no doubt; all alike condemn the practice and deplore its results. Mutual jealousies on the one side, and possibly respect for ancient usage on the other, keep it alive. In expressing a hope that the custom may soon be entirely surrendered, I feel sure of the concurrence of this assembly.

I have to congratulate you on the list of papers submitted this year for our consideration; they are all devoted to matters of great interest, and will deserve all the time we can give to them. At the same time, though there is not one of the list that we would wish displaced—and we certainly have not room for more—I do regret the absence of papers descriptive of works of a mechanical or engineering character, in progress or recently completed. Members are constantly engaged in the construction of new apparatus or buildings, and the materials are consequently never wanting. Such works occupy much of our time and thought, and would be as profitable in discussion as any that could be chosen; while we all recognize the important bearing which the judicious expenditure of capital has on the success of a gas undertaking. I presume that Mr. Livesey's paper will treat of this latter subject, and it is one worthy of his able pen.

I have already referred to the demands which gas engineering increasingly makes upon constructive ability and scientific knowledge; but the fact must not be lost sight of that gas works belong to what are essentially commercial enterprises, depending for success, to a remarkable degree, upon the manner in which engineering and science are directed, and even held in check by economic considerations.

There must be, for instance, but a sorry sort of satisfaction to the man who finds himself in charge of works, admirable in design and workmanship, and replete with every modern improvement, but necessitating the imposition of a sum, equal to seven or eight times the net cost of coal, to pay the statutory dividend thereon. I am not exaggerating when I say that there are places to be found where the coal, less residuals, costs but 3d. or 4d., and a 10 per cent. dividend, 2s. to 2s. 6d. per 1000 cubic feet of gas sold; or, in other words, the dividend alone, in one town, may absorb a sum nearly equal to the selling price of gas in another, and yet the management in each case may be equally efficient, and all the manufacturing charges the same, the whole difference being due to the disproportionate expenditure on plant in one case, as compared with the other. The time was when comparatively little heed was given to this aspect of our business. Works were erected, a statutory price

sufficiently high was obtained, and that was a successful undertaking which paid full dividends. But the publication of the analysis of London gas companies accounts by Mr. Field has brought home to every manager a ready means of comparison, and has no doubt imbued many with a healthy spirit of competition.

I am disposed to think that if ever the public did suffer on account of the monopoly of gas companies, that can only now be the case in very rare instances, most companies regarding themselves as in competition with every other similarly circumstanced, and striving to excel in providing superior advantages to their consumers. On these grounds, Mr. Livesey's paper will be of much value, if it goes to determine the relation that capital should bear to revenue.

Mr. Methven's paper will be listened to with interest, as promising a solution of the vexed question of a true standard for photometrical observations. Mr. Methven has brought his mind with his eyes to the photometer, and I think you will consider the result very satisfactory. I hear with much pleasure that we are to be favored also with a description of the means by which Mr. Vernon Harcourt has sought to reach the same end by the preparation of a gas of constant quality.

Permit me to refer to one other of the papers on our list. Some weeks ago, at the invitation of Mr. Carpenter, I visited Sheerness, and saw there the system of retort setting and arrangement for automatic feeding which he is to introduce to you. I do not now express an opinion as to the probable success of Mr. Carpenter's plan; of that you will be able to judge from his drawings and model, even if the paper should not be reached. I simply wish to express my hearty admiration of the care with which the arrangement has been worked out, and of the perseverance with which it has been followed up, under circumstances of no encouraging character. When members have the thought to conceive, and the courage to spend time, labor, and money in carrying out an idea which promises to result in improvement, this Association will always give its praise and help, even though the scheme be denied success. In no direction, I do not hesitate to say, notwithstanding the trials that have been made and the failures that have resulted, can the inventive skill of gas managers be more wisely directed than towards the attainment of a good plan of continuous carbonizing. That it will be done some day I have no doubt, and even many failures should not turn us aside from the search after what might prove, in economy, efficiency, and accuracy of manufacture, an illustrious step forward.

The past year has seen no alteration in the course of parliamentary dealings with gas companies, and it is a sign of the times that this should be a matter of remark. So many have been the changes and modifications of the treatment dealt out by committees, in recent years, that there has resulted a feeling of unrest and expectancy which is much to be deplored, and which is grossly unfair. The consistency of the last two sessions I would characterize as a persistent continuance in ill-doing; for the imposition of auction clauses, which all companies have had to submit to is, to my mind, unjust in the extreme. I cannot see any reason why a body of men, who have borne the expense and run the risk of founding a business, and who have diligently cultivated that business until it has become a successful one, should then be required to take in, on even terms with themselves, any one who chooses to invest his money in a good thing. I quite admit that, taken in conjunction with the sliding scale of dividend and price, as we at present know it, because with a fixed price, the smaller the capital upon which dividend is to be paid, the larger, naturally, will be the dividend. But there is no more finality about the normal price than there has been with the maximum price of past years.

Grant, then, that Parliament may re-arrange the price, taking advantage of the economies effected by the reduction of nominal capital through the operation of the auction clauses, and the sliding scale ceases to be a compensation, Personally, though I express the opinion with much diffidence, I prefer the legislation of 1847 to any of the schemes which have in turn been substituted. I deny altogether that any inducement to economy and enterprise was required other than was afforded by the natural desire to increase our business, and, consequently the capital invested in it. Under that Act the dividend has been in late years practically secure, so long as the works were properly conducted; and while the company gained the advantage of increased business, the consumer had, as he was fairly entitled to have, the advantage of such economies as were effected. The Act also furnished the Local Authorities with machinery amply sufficient to enable them to have examined the accounts of the companies, and to see to it that the consumers had all they were entitled to.

It is much to be regretted these powers were not used; had they been, there would probably have resulted more of trust in the *bona fides* of the companies. I maintain emphatically that the companies have striven loyally to carry out their obligations to the consumers, and that they have good reason to be proud of the success which has attended their efforts. It is not just to say that directors have been concerned only to obtain maximum dividends, because latterly the maximum dividend has been regularly earned. My experience has been, and I believe yours will confirm it, that there has been a disposition to encourage, rather than otherwise, investigation into such matters as promised advantage to the consumer, and inventors have not had occasion to complain of rejection without trial. I regret the change; the new system brings with it an element of gambling. Shareholders will be constantly "asking for more," and weak officers will be tempted to wrest accounts so as to gratify them; while a rise in the price of coal, accompanied, as has happened before now, by a fall in the value of products, would leave the recent investors with barely any return for their money. I make these remarks because, especially, I object to the arguments on which the change was based. The companies have labored hard and honorably in the past; they will continue to do so, I doubt not, in the future, and that irrespective of the legislation by which their profits are controlled.

During the year there have been several cases of transfer of gas works from companies to corporations, and generally, both sides have been content with the terms. There are two or three matters of interest in connection with these, to which our friend Mr. William Livesey has kindly directed my attention, which I will shortly name.

The Corporation of Clithorne agreed to pay to the gas company there the sum of £2887 10s., by way of bonus, for the uncalled portion of their shares, thus recognizing a position which the auction clauses annul. There has been a doubt frequently expressed in past years as to whether, in the event of a company being unable to pay their maximum dividend, the reduction should be proportionate on each class of shares, or fall entirely on the original ones; this has been decided in favor of an even reduction over all ordinary stocks.

There are several new provisions intended to fence the auction clauses from abuse—that only a certain amount of capital shall be called in any one year, that the shares shall be offered in lots of not more than £100, and paid up within three months.

It is remarkable, however, that notwithstanding the auction clauses, the dividend on new capital is restricted to 7 per cent. A share entitled to 10 per cent. dividend will always command a higher proportionate premium than one that is only entitled to 7 per cent., and therefore it seems to me clearly a mistake to fix on the lower rate.

I have little to say in relation to new processes or inventions. It is the less necessary that I should do so, as the "Treatise on Gas Lighting," now being published by Mr. King, has brought the record of improvements really effected close up to the day of our meeting, and in the columns of the Journal we have from week to week, full information upon any matter of interest affecting our business. I understand that our friend Mr. King, will be absent this year from the post he has occupied at the table at each of our previous meetings. I am sure you will all join with me in wishing him fully re-established health, and in congratulating him upon the deserved success which has attended his important work. Let me here acknowledge also the obligation under which we, as an Association, rest to Mr. King for giving us such help in the use of the Journal type, as enable our proceedings to be published in the form we have them, and at a price within our means.

Our fellow member, Mons. Bremond, of Versailles, has presented to the Societe Technique a most admirable and exhaustive paper on the subject of the cause and cure of naphthaline. The experiments there detailed seem to support fully Mons. Bremond's theory, and I believe that subsequent trials on a larger scale have established the success of his method. This is a matter for congratulation, not only to the patentee, but also to gas makers generally. The theory is that an excess of the vapor of naphthaline is kept in suspension in the gas by the presence of aqueous vapor, and that as the latter falls, through diminished temperature, the former falls with it.

It may readily be imagined that if a gas containing the vapor of a volatile body, together with aqueous vapor, be cooled, and the aqueous vapor is deposited in the liquid condition, this circumstance may determine at the same time, the deposition of some of the vaporized body, even though the temperature necessary for the deposition of the latter substance alone has not been reached.

There is one aspect of the question, however, which is now receiving a considerable amount of attention, and the settlement of which may cause many of us to alter our practice in condensation. Mons. Bremond, after noting the fact that naphthaline is a result of high heat in the retort, goes on to approve the custom generally prevailing, of keeping the gas in contact with tar for as long a time as possible, so that the latter may absorb the naphthaline. This advice is somewhat peculiar, seeing that by adopting the process of desication, which forms the subject of his patent, the naphthaline is retained in the gas to its palpable advantage.

Mr. Newbigging, in a letter to the Journal of Gas Lighting of the 4th inst., calls attention to the injurious effect upon the illuminating power of gas, resulting from intimate contact between it and tar, in the process of condensation, due to the absorption, not only of naphthaline, but of other hydrocarbons. That letter furnishes a concise examination of the whole question, and is of great value. Now the harmonizing of the two objects is made practicable by Mons. Bremond's system, and the result would probably be even more favorable than he promises. Remove the tar before it has commenced the absorption of gaseous hydrocarbons, dry the gas at the outlet of the purifiers, and the result would give, not only the six per cent. increase of illuminating value due apparently to the withdrawal of aqueous vapors, but a further per centage due to the retention of naphthaline. On this matter we shall certainly hear more at our next meeting.

As the paper prepared by Mr. Marshall, on purification by liquids, will deal with the process of Messrs. Wallace and Claus for utilizing carbonic acid, in which I feel a great interest, it is not necessary that I should refer to it here.

Messrs. Evans and Sugg are engaged in experiments—the lines of which have been explained in the Journal of Gas Lighting—for purifying gas by means of ammonia obtained from gas liquor, but I am not able to say how far success has yet attended their efforts. The preparation, either of caustic ammonia or ammonium sulphide, from ordinary liquor is a difficult and costly process, and is the barrier in the way of success in this direction.

Much interest has recently been felt and expressed in a proposal made by Mr. St. G. L. Fox, and illus-

trated by a practical experiment in Pall Mall, to light simultaneously the lamps of a district by means of electricity. It is certainly painful to see the waste of gas—and especially such good gas as we all make—necessary, under the present system, where some lamps must be lighted in broad daylight in order that all may be kindled before dark; but this is, of course, a simple question of balancing the value of gas against the cost of lamplighters time. Mr. Fox proposes to connect, say 200 lamps in one electrical circuit, and the action of his apparatus is thus described by the *Telegraph Journal*:

"Each lamp is provided with a small induction coil of the ordinary make, without, however, a condenser or a contact breaker. The primary wire of each coil is in the circuit of the line wire, so that a current sent through the latter traverses the primaries of all the coils of the set of lamps on a circuit.

"The secondary wire of each coil has one end connected to the pipe, and the other brought in close proximity to the burner of each lamp, so that if the gas were turned on at each, and a powerful momentary current were sent along the line, and consequently through all the primaries, induced currents would be set up in all the secondaries, and these currents would make themselves manifest in the form of sparks jumping from the end of the wires on to the burners, and the gas at each lamp would therefore be lighted.

"To turn the gas on and off at each lamp, Mr. Fox makes use of the core of each coil. This, when magnetized by a current of moderate strength, causes a permanent magnet, attached to a stopcock of peculiar construction, to be rotated on an axis, and thereby to turn the gas on. If the current be reversed, the movement of the permanent magnet is reversed, and the gas is then cut off.

"The action of the apparatus is as follows: When the lamps are to be lit, a positive current, say from a few cells of any kind of battery, is sent through the line. This magnetizes the iron cores of each of the induction coils, and the permanent magnet being thereby rotated, the gas is turned on. A momentary powerful positive current is now sent through the line. This sets up the induced currents in the secondaries, and the sparks from them light the gas. To turn out the gas, the current from the small battery is sent in the reverse direction to what it was in the first instance, and the permanent magnets being caused to rotate in the reverse direction to what they were at first, the gas is turned off."

The whole apparatus is very ingenious, not the least being the cock, which Mr. Fox has designed to offer as slight frictional resistance as possible. He makes the plug slightly less in size than its socket, and filling the annulus with glycerine, finds it sufficiently sound, and at the same time free to move with very slight force. Assuming that success attends Mr. Fox's efforts to perfect the apparatus, there remains the question of pecuniary advantage. The margin, after paying for cleaning and repairs of lanterns, amounts to about 12s. per lamp per annum, out of which has to be paid interest on the rather large expenditure, maintenance of much delicate machinery and the costs incident to the central station and the generation of the current. If these can be met without exceeding the present cost, the charming effects that would be produced nightly by its adoption should turn the scale in favor of Mr. Fox's invention.

I will now ask your attention, for a few minutes, to a question which has attracted increasing attention during the past year, and which is one of much interest to us, though having no direct connection with gas. I mean the electric light, and its possible influence upon gas companies.

The strides that electrical science has taken in recent years have been so great, that promises held out in its name are received with much respect, and it is not to be wondered at that great expectations are founded upon comparatively small achievements.

Although the electric light was discovered by Davy in 1813, it was not publicly exhibited, I believe, as a light likely to have useful applications, till about 1846, and even then the necessary electrical current was obtained from a galvanic battery. Now the battery, with its chemical action, has given place to mechanical force in the magneto-electric machine, where power and motion are transmitted into electricity. For a description of these machines I will refer you to some articles which appeared in the JOURNAL OF GAS LIGHTING in December last, or to a paper read by Dr. Paget Higgs before the Society of Arts, and reported in their Journal of April 5 of this year. To the improvements which have been effected in magneto-electric machines, is largely due the present position of the electric light. Take an illustration from the report of Dr. Tyndall and Mr. Douglas of the Trinity House, on the lighting of the South Foreland lighthouse.

Late in 1876 these gentlemen made a series of experiments to determine the relative value of various machines, in order to qualify themselves to advise the Elder Brethren as to the most suitable one for their adoption. For some years previous to that date, the light had been supplied to the South Foreland by a machine of the construction patented by Professor Holmes, and the fair inference is, that it was, when adopted, the best procurable. The result of the trial, against a machine made by Messrs. Siemens, which proved the best, was as follows:

Holmes—Cost £550; weight 51 cwt.; horse-power, 3·2; total light, 1523; light per horse power, 476.

Siemens—Cost £100; weight, 3¾ cwt.; horse power, 3·3; total light, 4138; light per horse power, 1523.

From these figures it will be seen that, on the important item of first cost of apparatus, the comparison stood thus:

Sum required to produce light of 1000 candles—
Prior to 1876..... .....£361
Present time..... 24
or in proportion of 15 to 1.

The importance of so considerable a reduction in charge for plant needs no comment. So far, however, these advances have barely any special interest to us, for the light produced from each machine, equal to from 700 to 1000 candles as a minimum, was necessarily concentrated in one center, and the sphere of its application was consequently very limited. The great power of the light was its weakness. But we are told this difficulty is being removed, if it has not already vanished. Various methods have been devised for breaking up the current from one machine, so that many lights may be supplied from it, presumably of less intensity, and consequently more adaptable to general use. Now, I venture to say that the progress made in this direction is practically almost *nil*. What has been accomplished is, so far as I understand it, as follows. Some makers have succeeded in so constructing large electrical machines that it is possible to establish several complete circuits from each. In other words, four or five machines are rolled into one and on to the circuit of each of these wires can be attached several (say five) lamps or candles, and in this way one machine supplies 20 lights. But I need hardly point out that this is not subdivision of the light. Each of the lamps so supplied is as powerful as would be one supplied direct by a small machine, and the extinction of one lamp puts out all the others on that circuit.

It would appear that the minimum power and intensity of the electric current necessary to the formation of the voltaic arc is such that a light of moderate power is not attainable. But the fact remains that the light is now applied in various places, especially in Paris, in substitution for the light of gas.

An influential company have been established in Paris for the purpose of introducing electric lighting, and the beautiful invention of M. Jablochkoff—the electric candle—is the property of this company. Thanks to their energy, and that of their able director, M. Denayrouze, the light is to be seen applied under many different conditions—in the streets and open places, in the courtyard of an hotel, in work shops and show-rooms, in public gardens, and in the theatre

In all these places the total light provided is vastly in excess of what was obtained from the gas formerly used, and the effect is naturally so much better. Especially in the streets, we will all agree that more light would not be thrown away, even in London. In some large open spaces, such, for instance, as the Place de l'Opera, when the lamps must needs be far apart, the electric light has a decided advantage over gas as usually burned, because it more thoroughly illuminates the broad spaces between lamp and lamp. But this is a very small matter, and one that, if raised by the street authorities, and accompanied by a proffer to pay for more light, could probably be met by our friend, Mr. Sugg, who would bring out yet another new burner.

Taking, however, the best illustrations afforded of the use of the electric light in places where, for the moment, the gas burners have been turned off before it, we see how impossible it is for it to do more than touch the fringe of our business. The necessity for using it in centers of great intensity involves also the necessity for fixing these foci at considerable distances apart, and this again that there shall be wasteful expenditure of light at the centre, if there is to be sufficient at the extremity of the field. The law on which photometric observations are based, namely, that the value of a light diminishes as the square of the distance it is removed from the point to be illuminated, explains this clearly.

Suppose a room, 100 feet by 20 feet, needing to be lighted to a certain minimum extent, which is met by gas burners of 16 candles value, lighting a radius of 10 feet, clearly five such burners would fully illuminate the room, and the candle power used would be 80. If the light must needs be given from one center, and that in the middle of the room, the total would have to be as the square of 50 is to that of 10, or as 25 to 1, giving 400 candles against the 85. But, if this one light is pushed back to the wall of the room, then, in order to get an effect at the opposite end equal to that given by the 16 candle burner, its value must be increased in the proportion of the square of 100 to that of 10, or as 100 to 1. The result of this is that while the light of 80 candles distributed would give the desired amount of light, 1600 candles, concentrated in one spot, at the extremity of the field, would be required to do the same work. The excessive brightness at the point where the light was centered would be so much waste, and an embarrassment rather than an advantage. Bearing this in mind, the electric light is certainly more costly than gaslight.

Take another illustration. I have here a letter from a firm of engineers in France, who have for some time used electric lamps in their erecting shop, which is 115 feet long by 86 feet wide. There are two lamps used, giving a light said to equal 3800 candles, and they are fixed at a height of 30 feet from the floor. (Such a position as this, on premises where power is always available when light is wanted, offers the greatest inducement to the adoption of electricity.) The cost, taken from the users figures, is as follows:

Cost of machines and lamps.....£208 0 0
Power required to drive same, 5 horses.

Cost per Year, 500 hours burning.

Interest at 12 per cent. to cover maintenance.....	25	0	0
Carbon, 9·4 in. × 500 × 6½d....	10	12	0
Coal, 4½ lbs. per horse power, at 21s. per ton.....	5	4	0
Supervision, 500 hours at 3·3d...	6	17	6
	£47	13	6

or 22·9d. per hour.

But if we add to this what my correspondents have left out, because they had not specially to provide it, namely, cost of engine, boiler, setting and chimney, say £200 for the 5-horse power engine, 10 per cent. on for maintenance and interest, adds £20 to the an-

nual charge, making it £67 13s. 6d., or 32·5d per hour.

I will assume the greatest amount of light to be required at a height of four feet from the floor, that 60 six feet burners are distributed along the shop in six rings of ten each, at a height of twelve feet. These would give out a light equal to 960 candles. The cost of this would be—

60 + 6 × 500 = 180,000 cubic feet of gas, at 3s. 4d.....	£30
Interest on fittings, £30 at 10 per cent.	3
Total.....	£33

or £14 13s. 6d. per annum less than electricity. But such a gaslight would be regarded as extravagant to a degree. It would be equal, at the point I have specified—four feet from the floor—to more than twice that of the electric light, if we regard light alone, and allow nothing for the superior diffusion of the light from many gas burners. The equation would be—

$$8^2 : 26^2 :: 960 : 10{,}140;$$

while the lamps only gave 3800. Thus twice the useful light would be had for half the cost. Remember also that this comparison is between gas which has paid the manufacturers full dividends, and the cost price of the electric light with no charge upon it even or distribution.

In this case the electric current was used in the most economical manner, namely, the whole strength of a machine concentrated on one light.

I am unable to furnish any exact figures as to the cost of lighting, by the system of M. Jablochkoff, with lights of less power; but it is certainly, light for light, largely in excess of the direct one. The division of the current, I am assured, involves both increased power and diminished light, and the carbons also are much more expensive. As an instance, I saw a room, about 80 feet by 60 feet, which had been satisfactorily lighted by 48 gas burners using about five feet per hour. In one night of six hours these would consume 48 × 5 × 6 = 1440 cubic feet, which, at 3s. 6d. per 1000, would be equal to 5s. The gas had been displaced by eight electric lights, in which the "candles" were changed every hour, and each cost, I was informed, 5½d. A night of six hours in this case, would, therefore, cost, for carbons only—

$$8 \times 6 = 48 \times 5\tfrac{1}{2}\text{d.} \times £1\ 2\text{s.}$$

Thus the carbons alone were costing (if I was rightly informed as to their price) more than four times the total cost of the gas. Add to this, interest on cost of machinery, cost of some 10-horse power absorbed in generating, payment of stoker and "gas man" in attendance, and it does not need royalty charges and shareholders profit to make the electric light a very costly luxury.

So much for the commercial aspect of the question. But I do not hesitate to say that if the figures had all been the reverse of what I have given you, I should entertain no fear as to the competition of the electric light for the following among many reasons:

1. The impossibility of reducing it to a power generally useful.
2. That it does not admit of regulation.
3. It is so variable and uncertain that no space can be left wholly to the illumination of one lamp.
4. Its color is more trying and wearying to the eyes.
5. The light must always require periodical attention on the part of the consumers.

In fact, so far as adaptation to the purposes of general, and especially of domestic, illumination goes, it appears to me that all the graver difficulties are as unconquered now as they were 20 years ago.

There is one aspect of the comparison between lighting by gas and by electricity which is worthy of remark, as explaining the magnitude of the plant that would be required by the latter. The electric light cannot be stored; consequently, the plant must be equal to producing the maximum amount required at the moment when it is wanted. A gas company with a capital of £1,000,000 are able to supply 1,000,000 cubic feet per hour at the time of greatest consumption. This is equal to a light of 3,200,000 sperm candles. I am safe in assuming that one horse power would not be equal to producing an electric light of more than 400 available candles. Now, dividing 400 into 3,200,000, we have 8000 as the equivalent in horse power of 1,000,000 cubic feet of gas. This power would need to be broken up into many sections, and would not cost for engines, boilers, houses, shafting, and machines, less than £80 for horse power; consequently, the 8000 horse power would cost £640,000. But then I have shown that, as compared with gas, not one-fourth of the effect of the electric light is actually obtained; consequently, because of the disadvantageous circumstances under which it is burned, at least four times as much must be provided. If the £640,000 is multiplied by four, we have £2,560,000 as the cost of producing plant alone, exclusive of distribution, against £1,000,000 for gas, including all, and that estimate is not at all surprising, judged by the illustrations we have had opportunity of examining hitherto.

If I have occupied too much time by these remarks, I beg you to excuse me; I had no intention of dwelling so long on the subject when I commenced.

And now let me, in conclusion, say a few words suggested by the recent scare as to what, in my humble opinion, should be the future policy of gas companies.

Nothing has come more prominently to the front in the discussions which have taken place than the wonderful adaptability of gas to the various requirements of artificial illumination. We supply a light which is cheap, safe, pleasant, and unfailing, whether as a diminutive night-light or a brilliant glare. But further, with the same material, we can cook the delicate omelette to perfection, and the dinner for the million with economy. Gas, too, is a cheap and convenient motor, whether for driving a hairbrush, an electrical machine, or, to venture upon prophecy, a tramway car. It is also capable, without causing dirt or needing attension of warming our houses in situations where otherwise warmth would be difficult or impossible of attainment. Then again we are manufacturers of other products which are the basis of important industries. The salts we produce are of such fertilizing power that they cause the desert to rejoice and blossom; while from another residual, among uses of a more prosaic but still profitable character, we are able to lend to beauty the glories of the rainbow. But it is not necessary that I should dilate upon the variety of our resources; suffice it to say, that we are alive to the fact, that every material formerly regarded as obnoxious is only so much matter out of place, and which may eventually be developed into an element of profit.

Now the question I would ask is the same in effect as that which was put with so much power and weighty argument by Mr. Bennett last year. Have we done full justice to this great inheritance? I do not think we have much need to be ashamed of the past, but we have certainly a large field before us which will amply repay the cultivation of it. We congratulate Mr. Warner that the step he initiated last year, and which was described by one Past-President (Mr. Spice) in language of glowing approval, had borne fruit beyond the limits of South Shields. Stockton has had an exhibition of gas apparatus and products of the gas manufacture, which "won golden opinions from all sorts of people;" and more recently Birmingham has opened its Town Hall to the reception and exhibition of such a collection of apparatus for the economical and convenient use of gas in its multifarious applications, as has never before been attempted. These exhibitions have been accompanied by what is of vital consequence to their use, namely, full information as to the cost at which the work shown is accomplished. These exhibitions are important strides in the right direction. What is wanted now is that they shall become at least in all large towns, universal, and that they shall be permanent.

I commend to the attentive observation of all who visit Paris, the means adopted by the Paris Gas Company to educate the public in this way, both as to the use of gas and coke. I hope we may soon see similar establishments opened here, where consumers will be able to ascertain how best to use the commodity with which we supply them; for in this way a reproach will be lifted from us, and a great service rendered to the public.

Our true interest lies in so conducting our business that our position as monopolists is lost sight of. We should proceed upon the lines indicated by the successful tradesmen in active competition, who are ever ready to press the question, "Is there anything more that we can do for you?"

I have previously touched upon the relation which the charges due to excessive expenditure of capital bear to the selling price of gas. Permit me to point out what a reserve of security and usefulness we at present possess in this direction. We are all aware that gas works must be planned and laid down, not relatively to the annual sale, but to the greatest day demand; and our calculations would be imperfect if we failed to take into consideration the maximum hourly consumption; for mains which would be competent to distribute a day's make over six hours, would manifestly prove inadequate to pass the same quantity in five. But the shortened hours of labor of late years have limited the maximum rate of consumption in many towns, I am told, to little over two hours. Our plant, therefore, must be large enough to meet the strain of a few hours demand which is greatly in excess of that of the rest of the day, and in summer time, some 70 per cent. of it may be said to be idle.

Now let me suppose a town where the selling price of gas is 3s. 6d., and the charge for dividend on capital 1s.; we have thus 2s. 6d. per 1000 cubic feet as the cost of gas at the consumer's meter. Out of the 2s. 6d., it is reasonable to suppose that leakage, distribution charges, rates, and management, will cost at least 8d. per 1000. Now, the actual expenditure under all these heads would be practically the same if the sale of gas were doubled by a day consumption. I assume that distributing plant, including gas-holders, represents one half the capital account, and, consequently, one half of the 1s. required for dividend. We have then 6d. for interest and charges amounting to 8d., in all 14d. as costs not dependent upon annual consumption. Now, assume that the public have been made alive to the undoubted economy of gas for cooking, warming, etc., and that the consumption is thereby doubled by a day demand, clearly the 14d. which I have named would, in that case, be divided by two, and gas could be sold for 7d. less, or 2s. 11d. against 3s. 6d. per 1000 cubic feet. Many managers are fully alive to these considerations, and, I think, they are destined to have increasing weight. Let us here, in our Association, and at home in our individual spheres, lend our earnest attention to still further improving the quality, and cheapening the price of gas. Let us also educate our consumers into the proper use of it, and the future of our industry will be at least as bright as its immediate past.

Gentlemen, I have trespassed too long on your patience, accept my thanks for the kindness with which you have listened to me.

The PRESIDENT then announced the award of premiums for papers read last year, as follows- No. 1, Mr. C. Woodall; No. 2, Mr. R. O. Patterson; No. 3, Mr. W. H. Bennett; No. 4, Mr. W. Sugg. He also stated the arrangements which had been made for the excursion to Hampton and to Paris, where, he said, French friends had made every effort to ensure a pleasant and interesting visit.

Messrs. Hartley and Darwin were appointed scrutineers of the ballot papers for the election of the Officers and Committee of the Association for the ensuing year.

[To be continued.]

Correspondence

[Correspondents, in all cases, should sign their communications with their names and address in full—not for publication, unless desired, but as a guarantee of good faith.—Ed

A Correction.

Evansville, Ind., July 23, 1878.

Mr. Editor: In the issue of your valuable paper of 16th inst. you say, "Evansville, Ind., has let a contract for lighting her streets for five years at $2 per thousand cubic feet, with a proviso that in case electricity shall come into vogue for street lighting, the contract shall be modified to suit the emergency." As there is a slight inaccuracy in the figures, I will give you real figures of our contract.

The contract is for six years, Gas to private consumers, city and public buildings $2 per thousand cubic feet nett; public lamps $20 per annum, 5 feet burners; burn 2650 hours per annum. Company lights, extinguishes, cleans, and keeps up all repairs. The proviso you publish is correct.

Yours with esteem,
Evansville.

61 Liberty Street, N. Y. City,
July 21, 1878.

Mr. Editor: In your issue of July 16 my attention was called to the annual report of the Richmond City Gas-Light Company, Richmond, Va. In this report there is one part relating to the number of cubic feet of gas purified per one bushel of lime, namely, 2,498 cubic feet.

The inference may be drawn that it is owing entirely to the coals mentioned, that may have been employed, "such as Despard, Clarksburgh, Murphy Run coals, and the like from Western Virginia, it can be easily accounted for." Having had the pleasure of visiting the Richmond Gas Works, also being received in the most cordial manner by the gentlemanly superintendent, Mr. J. H. Knowles, I found that they were using the ordinary series of vertical pipes for the condenser.

It is reasonable to suppose that the extra labor upon the purifiers is due to the inability of this form of condenser to remove a larger percentage of the impurities existing in the volume of gas. There can be no doubt but what they were doing all that could possibly be done with them. The purifiers in this case were performing the partial duties of the condenser

I have received a letter from Mr. Chas. S. Allmund, the President of the City Gas-Light Company of Norfolk, Va., dated July 6, 1878, that may be of some interest to the readers of your Journal. The coal employed at Norfolk being about the same as at Richmond (cannel excepted), after using one of our scrubbers for three months upon trial, he says:

"We are well satisfied; our last month's report of operations shows an average yield of 5 05 cubic feet of gas per pound of coal; average candle power, 17; unaccounted-for gas (including that used at the works), 8 08 per cent, showing that our station meter is not fast; 7,400 cubic feet of gas purified per one bushel of slacked shell lime. We are now getting an equal yield and candle power from one-third Clover Hill (a much cheaper coal) and two-thirds West Virginia"

This fact will readily explain itself without much comment; 7,400 cubic feet of gas purified from West Virginia coals is what may be termed good results, by using one bushel of slacked shell lime. I quote the above simply to remove any unfavorable impression that may have been made against this class of coals that is mentioned; also proving the importance of proper manipulation of the gas before reaching the purifiers. It is only proper and just to add, that the difference in results should be charged to the right cause—more to the inability of the condensers in performing the work assigned, than to the quality of the coals employed.

By giving this a place in your columns you will oblige Yours very truly,
William H. St. John.

Destructive Cyclone—The Damage in North Albany.

THE PEOPLE'S GAS-LIGHT CO., BADLY DAMAGED.

The principal sufferers by the cyclone were the People's Gas-Light Company, situated on the east side of Broadway, opposite Gennessee street. The main tank building in which the gas tank is enclosed, suffered the worst injury of any of the buildings. The structure is a circular one, 80 feet in diameter and 44 in height. It is calculated to contain 210,000 cubic feet of gas, but at the time of the accident was only about half full. The cyclone swept over it with terrific force, carrying off the roof and demolishing half of the walls, which are fully eighteen inches thick, and composed of solid brick work. The tank enclosed by the building, the supports being removed, fell with a crash, and the interior was filled with the debris. Besides this a large amount of water poured into the tank. The tank house is said to have cost $100,000, and is supposed to be damaged to fully half that amount. The retort house was uninjured except a hole in the roof, caused by some missile striking it. The purifying house escaped injury with the exception of slight damage to the walls, and the breaking of a large number of window glasses. The coal sheds in the rear of the purifying house were completely demolished, being at the time, about a third full of coal. The sheds were 100 feet long by 30 feet wide. From the coal sheds to the bank of the canal, a distance of about 400 feet, a railroad on an elevated tressle work, had just been constructed to be used in transferring coal from boats in the canal to the company's coal sheds. The railroad was elevated about thirty feet above the ground, and though very solidly and substantially constructed, was completely demolished. On the bank of the canal had been placed a small stationary engine, by means of which the coal cars were to be operated, and alongside was a large derrick, by means of which the coal was to be hoisted from the canal boats to the coal cars. The derrick was snapped off by the wind as though it had been a pipestem. The engine is not thought to be damaged. The whole apparatus was only finished on Saturday, and was to have been tested to-day. It is now a complete ruin, and it will be many weeks before it is ready for operation, Owing to the escape of all the gas from the tank, that portion of the city north of Steuben and Elk streets was enveloped in darkness during the night. This will be remedied this evening, however, for the company will be able by that time to furnish gas from the tank on DeWitt street. The loss to the company will reach about $20,000.—*Albany Evening Journal, July 22.*

The Holly Steam Heating System.

TO BE TRIED IN SPRINGFIELD BY THE GAS COMPANY THIS WINTER.

The Springfield gas company has bought the right for this city to use the Holly system of running steam pipes through the streets to furnish heat and power for adjoining buildings, and the city government will be asked to permit the construction of an experimental line this winter from the company's works on Water street through Elm to Main street. This short line will reach a number of dwellings, stores, and offices, a large school house, the county court-house, and the First church and chapel, in which, with the exception perhaps of the church, it is hoped that a trial of the system may be made, the most distant point from the works being the Chicopee bank. It is no new thing of course to heat more than one building by steam from a single furnace, this already being done in this city in the armory buildings, and in the Boston and Albany building and depot.

The Holly system, which is owned at Lockport, N. Y., and is in most successful operation in that city, includes numerous improvements in the protection of the pipes laid in the streets, the arrangement of connections, valves, traps, etc. In the works at Lockport steam is conducted two miles, and Mr. Holly claims that a distance of five miles can be reached. The pressure on the pipes in the streets is about 50 pounds, and in the houses about 10 pounds, although only one or two pounds is needed for heating.

The Lockport company began on the basis of charging for the heat about as much as had been before paid for fuel, but introduced meters as soon as the enterprise was fairly established, and a similar course will doubtless be pursued in this city. The amount that can be saved to consumers by this system is evidently large, since there is inevitably a waste of fuel in connection with every fire, and a great deal of dust and dirt that are injurious to furniture and health.

Some of the Lockport housekeepers told visitors from this city that they hardly considered it necessary to clean house in the spring, while their houses had been heated throughout so thoroughly that they scarcely knew of the changes of temperature out doors. The steam is also used for cooking, and is equal to almost any culinary operation, except frying and broiling. Experiments have also been made in clearing sidewalks of snow by the use of steam, and the cost of melting a ton of snow is found to be but five cents. The steam distributed by this system has not been much utilized for power yet, but there can be no doubt that it is available, since the requisite pressure is kept up on the pipes and engines of considerable size, have actually been run by it. It is thought that connections can be made for sewing-machines in private houses, for printing presses, coffee grinders and similar purposes.

If the proposed experiment through Elm street succeeds, as there is little doubt that it will, the improvement will be pushed next season to more distant parts of the city. The works at Lockport, which have now been built for about a year, have attracted very general attention, and Springfield is one of a number of cities that propose to avail themselves of the plan, a company with $1,000,000 capital having been recently formed in New York city. The work in this city is fortunately under the direction of Mr. Geo. Dwight of the gas company, whose extensive experience in this line of business and executive ability ensure its success. The work will be nominally under other auspices, until the gas company can secure an amendment to its charter authorizing such an undertaking. —*Springfield Republican, July 22.*

Something More Concerning the Gas Question in St. Joseph, Mo.

CITIZENS' GAS-LIGHT COMPANY.

By order of the Directors of the Citizens Gas-Light Company of St. Joseph, Missouri, notice is hereby given that a meeting of the stockholders of said company will be held at the office of the said company in the city of St. Joseph on the 16th day of August, A. D., 1878, between the hours of 10 o'clock in the forenoon and 12 o'clock noon of said day, to vote upon the question of selling and transferring the works and property of said company, and for doing such other business as may properly come before the said meeting.

Dated this 19th day of July, A. D., 1878,

D. Henning,
John M. Wheeler,
Philip Bach,
J. W. Knight,
E. Wells
Directors.

THE MUTUAL GAS-LIGHT COMPANY OF ST. JOSEPH, MO.

By order of the Directors of the above named company, notice is hereby given that a public meeting of the stockholders of said company will be held at the law office of Allen H. Vories, 218 Francis street, in the city of St. Joseph, Mo., on the 15th day of August, 1878, between the hours of 9 o'clock in the forenoon and 5 o'clock in the afternoon of said day, for the purpose of voting on a proposition to increase the capital of said Mutual Gas-Light Company, the

sum of thirty thousand dollars, and for such other business as may lawfully come before such meeting.

C. H. Nash,
A. W. Ogilvie,
Thos. Pringle,
Allen H. Vories.
K. M. Mitchell,
July 24, 1878. Directors.

A RUMOR THAT THE OLD COMPANY HAS SOLD OUT TO THE NEW.

For some time there have been rumors floating about on the streets that the new gas company had sold out to the old, and that the latter company was to take possession of the new works and carry on their business as heretofore. But now it seems that the tables have been turned. Instead of the old company gobbling up everything and pursuing the even tenor of its way, it seems that they have given the thing up as a bad job. Councilman Jenkins yesterday morning received a letter from U. C. Chapin, of Detroit, formerly manager of the old company here, stating that the old gas company had sold their works to the new company here, and that the latter would continue business Thus it seems that the gas war was over before it was fairly begun. None of the agents of the new company here seem to know anything about the affair, or if they do, they keep discreetly silent.—*St. Joseph, Mo., Gazette, July* 23, 1878.

Brooklyn Gas Companies.

ASSESSING THE CAPITAL STOCK OF GAS COMPANIES.

After a lengthy controversy the Board of Assessors have fixed the assessment on the personal property of capital stock of the various gas-light companies.

The following are the assessments:

Williamsburgh Gas-Light Company—Par value of capital stock, $1,000,000; par value of certificates of indebtedness issued to stockholders, $1,000,000; amount of capital stock held by literary and charitable institutions and exempt from taxation by law, $33,800; cost of real estate to be deducted from capital stock, $589,275; actual value of balance of capital stock and certificates of indebtedness assessed at $825,609.

Citizens' Gas-Light Company—Par value of capital stock, $1,200,000; par value of certificates of indebtedness sold for cash, $320,000; cost of real estate to be deducted from capital stock, $650,446; actual value of balance of capital stock assessed at $412,000.

Metropolitan Gas-Light Company—Par value of capital stock issued, $869,900; cost of real estate to be deducted from capital stock, $585,500; actual value of balance of capital stock, assessed at $184,800.

Nassau Gas-Light Company—Par value of capital stock, $1,000,000; par value of certificates of indebtedness sold for cash, $700,000; cost of real estate to be deducted from capital stock, $755,353; actual value of balance of capital stock assessed at $171,200.

People's Gas-Light Company—Par value of capital stock, $1,000,000; par value of certificates of indebtedness sold for cash, $300,000; cost of real estate to be deducted from the capital stock, $781,000; actual value of balance of capital stock assessed at $54,700. —*Union Argus.*

Tale Telling Gas Tubes.—M. Izarn, at the Lycee of Clermont noticed that he was able to hear the Morse signals from the Telegraphic Bureau and from the Artillery School, although there were no wires near enough to account for the fact. He found that there were gas tubes in the neighborhood, and he supposed that the message was conveyed by a derived current, through the intervention of the moist soil and a net work of tubes. He satisfied himself by experiment that the phenomenon could not be explained by the telluric currents, and suggests the importance of taking propor precautions to prevent the secrets of the telegraph from being exposed in this unexpected way.—*Comptes Rendus.*

Gas-Light Intelligence.

Mr. C. F. Smith, recently of the Citizens Gas Co., Newark, N. J., has been appointed Superintendent of the Woonsocket (R. I.) Gas Works.

OUR EXCHANGES.

United States.

[*Engineering News.*]

Contract Awarded.—The Peoria, Ill., Gas-Light and Coke Co. won their point before the City Council on June 12. They get the contract for lighting at $25 per street lamp per year, and $2.25 per thousand feet to citizens. The contract is to run for six years.

Completion of a Gas Works.—Waterloo, Iowa, is busy on its proposed gas works; it is expected that the work of laying street mains will be commenced in a few days.

To be Suspended.—It is feared that lighting the streets in Quebec will have to be suspended for the want of funds.

Lighting Street Lamps with Coal Oil.—Cheap coal oil is being used in Guelph, Ontario, street lamps, but the saving is whittled off the other end by the breakage of chimneys.

Naphtha for Street Lamps in Brooklyn.—In the city of Brooklyn, N. Y., the experiment of lighting the streets with naphtha is to be begun with 1000 lamps. An exchange says? "The fire insurance companies will take a lively interest in this new departure."

The Washington Gas Co.—The Washington (D.C.) *Post* says; "The Washington Gas Co., will be informed that the Commissioners have agreed to allow said company $32 per lamp per annum, including repairs, the city to furnish new lanterns and new lamp-posts when necessary. A great deal of just and reasonable complaint has been found by citizens with the methods allowed and adopted by the gas company for lighting the streets—methods founded on the phases of the moon. The truth is, the people want and will insist upon having the street lamps lighted every night—all night. Nothing less will satisfy a reasonable demand."

[*From the Plumber and Sanitary Engineer.*]

The Largest Distribution.—The Boston Gas Co. distributes a larger amount of gas per miles of pipe main, than any other company in the United States.

A Large Capital.—In making gas for lighting London a capital of fifty-five millions of dollars is employed, and the total gas rental is fifteen millions

Exhibition of Gas Apparatus.—Several exhibitions of gas apparatus have lately taken place in England, with the object of illustrating the greatly extended uses to which gas can be put.

A Relic of Past Years.—A forty-year old gas pipe was dug up in Maiden Lane, N. Y., lately, and though very rusty it was not otherwise defective.

Destruction of Gas Pipe by Corrosion.—We were lately shown a section of 2-inch gas pipe, rubber coated within and without, in which the lining and outer covering were both destroyed by the corrosive action of the gas. The inside seemed filled with a sort of fungus growth, so that it was difficult to see through it.

Heavy Steam Rollers Injurious to Gas Mains.—The use of heavy steam rollers on public roadways is deprecated by the London *Journal of Gas Lighting.* It says: "In London we had on explosion lately, attended with fatal effects, which clarly resulted from the fracture of a main caused by a steam roller. If these ponderous engines are to come into general use, all gas pipes must be laid much lower beneath the surface than they are at present."

Effect of Gas-Light on the Eyes.—In a medical report to the German minister for education, it is claimed that gas light has no prejudicial effect upon the eyes, provided they are protected from its direct action. The committee recommend shades and bell-glasses of translucent glass porcelain. They disapprove of opaque metallic shades, since when they are used, the eyes though themselves in shade, gaze upon a strongly illuminated surface, and become dazzled and over-stimulated. The burner should not be too near the head, as the heat is liable to cause headache and even congestion. Care should also be taken to prevent flickering. The use of dark blue glass is suggested in cases of irritation.

[*From the Republican.*]

The Lowe Process—Notice to Gas Consumers'—The Scranton Gas and Water Company are now supplying their customers with gas manufactured by the Lowe process. Experience has shown that under certain conditions this gas will absorb and carry forward to the burners the tarry impurities deposited in the service pipes by coal gas. This trouble is usually of brief duration, and consumers who find their light unsatisfactory are requested to notify the company, when prompt and gratuitous relief will be afforded. As the density of the new gas is much greater than of that heretofore supplied, it is recommended to consumers in order that they may secure the most perfect light, that they use batwing burners, gauged to consume not less than five feet of coal gas per hour, which will, however, consume twenty per cent. less of the new gas. C. E. Judson, Sup't.

Scranton, July 12, 1878.

A New Safety Lamp.

Mr. John Williamson, Hednesford, manager of the Cannock and Rugeley Colliery Company's works, has, after a long series of experiments, introduced to public notice a new safety lamp, which appears to combine the meritorious features of former lamps, and to avoid their drawbacks. For instance, it is claimed for it that it is as safe as the Stephenson—the safety lamp hitherto introduced, but objected to on account of its dim light—while it gives a better light than even the Clanny, and it is not easily extinguished when exposed to air travelling at a high velocity.

The inventor believes that the firing of a shot, the closing of doors, or the fall of a roof is sufficient to cause the Davy, the Clanny, or the Mueseler lamp to explode when in use in an explosive mixture, but his own lamp has been subjected to severe tests both by himself and by engineers in the North of England, and in no case can it be made to explode. As a fireman's lamp it is stated to be invaluable, inasmuch as when it is approaching a body of gas the top or hole can be seen clearly, but if the lamp be plunged into a body of gas the light is extinguished before sufficient heat can be generated to do harm.

In appearance the lamp is like the Clanny, the bottom, or oil vessel, and wick arrangement being the same. It contains two glass cylinders, an external one similar to the Clanny, and an internal one similar to the Stephenson, the latter being also capped with a copper or gauze cap, as in the Stephenson. The gauze in the lamp is similar to the Clanny, but without a cap. The improvement, as compared with the Clanny, consists in the arrangement of the inner ring, which in this lamp carries both glasses, and, when screwed up presses the cap of the inner glass gently against the top of the gauze. The air passes through a perforated portion of the bottom part of the lamp, and through the gauze fixed on the periphery of the inner ring and on to the flame; and the lamp is described as really a double lamp, there being no danger even if the outer glass and gauze be stripped away, so long as the inner glass remains intact.—*London Mining Journal.*

Coke from Anthracite Dust.

At the suggestion of a member of the Geological Survey of Pennsylvania, the writer made a number of experiments in using anthracite coal as a basis for coke. The additions of bitumen, gas tar (gasworks waste) or bituminous coal were all used in the mixtures with a view to supplying the necessary qualities lacking in anthracite. An ordinary blacksmith's fire supplied the heat required, black lead crucibles of about one pound capacity being used to receive the mixtures. The result arrived at proved several points:

1. That any mixture varying from 50 per cent, anthracite dust and 50 per cent. bituminous dust to 75 per cent. anthracite dust, 10 per cent. gas tar or bitumen—for they are interchangeable—and 15 per cent. bituminous dust, will make a beautiful steely, lustrous, heavy coke.

2 That a heat higher than can be obtained in a coking oven is an absolute necessity to produce a good anthracite coke.

3. That in order to obtain a commercial success in producing anthracite coke, the utilization of the gas contained in the bitumen and bituminous coal must be a part of the process, at the present price of anthracite coal.

It may be interesting to state that through the kindness of the Harrisburgh gas company the writer was enabled to make an experiment on a large scale; 260 lbs., or 52 per cent. anthracite dust, 150 lbs., or 30 per cent. bituminous coal dust, and 90 lbs, or 18 per cent. gas tar, were taken. making a charge of 500 lbs., which was placed, after thorough mixture, in three ordinary cast-iron retorts. For four hours these retorts were subjected to the bright-red heat employed in making illuminating gas in iron retorts. The coke resulting was perfect, though not hard enough for blast-furnace use. It was tried in a blacksmith's fire, and produced a very high heat, quite equal to that of the best soft coal fire., with the advantage of making a fire free from smoke. Were it possible to make anthracite coke on a large scale equal to what can be produced in a small way, there is no doubt that the vast hills of anthracite dust now cumbering the earth near the breakers would be utilised. The following mixture will make a solid, lustrous coke, provided the anthracite coal dust is finely pulverised and the bituminous coal and gas tar are thoroughly mixed before charging, and are subjected to a white heat for about 1½ hours; 65 per cent. anthracite dust, 25 per cent. bituminous coal dust, 10 per cent. gas tar. A good coking bituminous coal was subjected to a similar treatment as the above mixture, and the result was an inferior coke, notwithstanding the fact that some coal coked well in a blacksmith's fire. —*Jones Wister, in Metallurgical Review.*

Treating Spent Oxide of Iron from Gas-Works.

That the spent oxide of iron arising from the manufacture of gas contains certain valuable substances has long been known, and Mr. Peter Spence, of Manchester, has now patented an invention by which it is proposed to extract them. The material to which the invention refers is the hydrated oxide of iron now generally used for the purification of illuminating gas, and when, having become spent, it is no longor of use in the said purification, and has to be replaced by a new charge. In this condition, however, it contains valuable substances, some of which he extracts by his invention, and after they have been extracted he has rendered the oxide of iron again fit for use in the said purification of gas. He takes the spent oxide and places it in suitable tanks and by water, either cold or hot, he dissolves and washes out any compounds of ammonia it may contain; this is needful for subsequent operations, but does not of itself constitute any part of the invention. He now turns the material on to a floor, and lets it drain until tolerably dry. He then takes unslacked lime, equal in quantity to one-half of the spent oxide, and slake it into a fine dry powder. and with this dry powdered hydrate of lime he mixes intimately the drained spent oxide, and place the whole in tanks, preferably of iron, having each a false bottom, also of iron, such false bottoms being provided with numerous small holes, and having a pipe (say, of 3 inches diameter) arising from under the false bottoms of the tanks to the surface, and through which water or solutions can be poured directly into the spaces between the bottoms and false bottoms of the tanks.

The tanks having been filled with the mixture, water is poured through the pipes mentioned until it rises over the material, and which water may be heated to 150° or 160° Fahr., but should not be nearer the boiling point. The liquid overflowing or drawn off may be used at once, or passed into other tanks to strengthen it; in the former case it is run into a reservoir until clear, and it is then run into precipitating vessels, and has added to it a solution of perchloride of iron, with a slight excess of hydrochloric acid, until no more precipitation takes place. The precipitate is Prussian blue, which, after subsidence, is washed by renewed waters, and is then either made into pulp blue, or dry Prussian blue, as is well known; or, after the said washing or subsidence, he adds to it a sufficient quantity of potash to decompose the Prussian blue, and the solution so formed he boils up until it is ready to crystallise prussiate of potash.

The spent oxide having had all the prussiate of lime washed out is now, without removing it from the iron tanks, covered with water, and submitted to boiling by blowing steam into the spaces between the two bottoms. A dark solution of sulphide of calcium is formed, and he continues to boil and run off until all is extracted. This solution he runs into another series of tanks. After settlement, and when cold he adds to it hydrochloric acid, until the liquor has a slightly acid reaction. Sulphur nearly pure is now precipitated, and this having been washed, drained, and dried is fit for most of the purposes for which brimstone is used. The spent material in the tanks is now drained and dried, and is fit for being again used in the purification of gas.—*London Mining Journal.*

The Relation of Science To Industry.

There has been a great deal written upon this subject; a great deal too much perhaps. There is always a certain amount of cant afloat among the people. Dean Swift used to wage bitter warfare against it. In those days it used to dress in priestly garments and assume a saintly air, now it goes about with a learned look and prates of this and that, as if it carried the cosmos under its hat and was not made of dust and ashes. But it is the same hollow pretender to-day that it was then. It is the same false prophet whether it stand behind the pulpit or reads a sounding paper before some learned society.

In these times we all know how common this scientific cant is, and we all know how to tell it. True science is a worker. True science thinks rather than talks. In most places there is more talking than thinking; there is more buncombe than science. Again, true science is modest, not loud and ranting; it works in the silence, often in the dark; and, in short, science is truth-seeking, cant is self-seeking. This loud-mouthed ranting of empty heads has done much to throw discredit upon science in the eyes of practical men. But let us remember the distinction we have made, and let us make the application until we have separated the wheat from the chaff. We have said that science was truth-seeking. This is the kernel of the whole matter. Science in its broadest, widest aspirations seeks to take in the rays of light that stream in upon it from the remotest star in the universe to the nearest, minutest atom of earth dust, and to bring it all to a focus upon its camera. It seeks to reproduce in miniature the great universe about us, so that before its vision it can see accurately photographed each fact and factor in the great whole we call nature. This is science. It is not a mere aggregation of facts. That would be a chaos; but it is an arrangement of facts gained with infinite labor from the top of the Andes to the bottom of the deepest ocean, gathered by men young and energetic, and by men old and worn with years. It is an arrangement of facts so made that they show their natural relationship to each other, the forces at work among them, and the law that knows no breaking. This is what science is. It is our heritage from all the past. It is our storehouse for all the future. Now has industry no interest in this store of knowledge wrested by the work of the best minds that have ever come into existence? Let us see. What would industry be were it to become petrified? It would be what China is to-day. If, then, progress and improvement are necessary, whence can it come but from a wider, a deeper knowledge of the facts and forces about us. Where can one get that but from science? Here it is arranged, classified, labelled by the hand of some great master. This is not very new, but it is very true, and we are all liable to forget it in the bustle of the workshop and the field. The practical man has got to look on scientific knowledge as all very well, but he does not see just how it bears on his work. He may agree about all this in a general sort of way, but he does not find the help from science that he ought. What is the result? Ask any one who has been to the Patent Office at Washington, and hear what he has to say on the endless host of men who have wasted years on the perpetual-motion phantom. Stop to think for a moment of the wasted brains and bullion that has been put upon this one mistaken effort. Think again of the additions that might have been made to our industrial resources, if science had directed this energy and capital. Science then is valuable to industry, first, because it avoids expenditure of energy in the wrong direction. In the second place, science helps in suggesting new fields for inventive and industrial genius. Science, pure science remember, is only the orderly arrangements of facts. It is not the application of them—that is the field of the inventor and the practical man. But let us see what has come to industry from the pure sciences. We do not need to search for illustrations, but rather to omit, there are so many at hand. In the first place look at the work of Michael Faraday, a poor book-binders apprentice, who devoted his life to the study of pure science without any idea but the love of truth. And behold the result of his labor in manifold applications of his discoveries in the laws of electricity that teem on every hand. His name, like Franklin's is a name to conjure with. Again, see how chemistry has made of coal tar dye-stuffs that rival the rainbow's hues. But examples are needless. Let us learn the lesson. Let us send our inventors, our miners, our mechanics, our farmers, our children to learn not of loud-mouthed talkers, but of science what is and what is not a possible or a useful combination of force and matter.—*Mining and Scientific Press.*

Prices of Gas Coal.

Waverly Youghiogheny	5.25	
Moore's "	5.50	
Shafton	5.35	
Despard Marion	5.15	
Newburgh Orrel	@	3.85 at Baltimore.
Murphy Run	5.25	
Chesapeake and Ohio Agency Coal	5.25	4.00 at Richmond.
Newcastle	3.75 @ 3.85	
Provincial	4.15 @ 4.50	
Cannelton Cannel	10.00	
Ince Hall	8.00	

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THE UNDERSIGNED ARE PREPARED TO EXECUTE ORDERS FOR

NEWCASTLE COAL (NEW PELTON),

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PROVINCIAL GAS COAL,

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We supplied nearly 100,000 tons of Provincial Coal to some twenty-five different Gas Companies in 1877. These coals will yield in practical use fully

10,000 Cubic Feet of 16 1-2 Candle Gas---40 Bushels Coke.

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PERKINS & CO.

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Gas Stocks.

Quotations by G. W. Close Jr., Broker and Dealer in Gas Stocks.
(with W B Scott & Co.,)

24 PINE STREET, NEW YORK CITY.

AUGUST 2, 1878

☞ All communications will receive particular attention ☜ The following quotations are based on the par value of $100 per share.

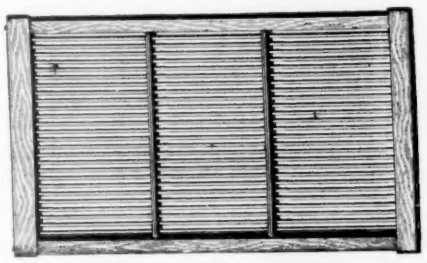
The Metropolitan Gas Co. of N. Y. City have declared a dividend of 5 %, payable August 6th at their office.

Coupons of the bonds of the Mutual Gas Co., N. Y. City, are payable at the Shoe & Leather Bank August 1st.

The Richmond Co Gas Co., S. I., have declared a dividend of 3%.

	Capital.	Par.	Bid.	Asked.
Gas. Co.'s of N. Y. City.				
Central, Westchester	466,000	50	—	80
Harlem	$1,850,000	50	75	80
Manhattan	4,000,000	50	185	190
Metropolitan	2,500,000	100	132	135
" Scrip	$1,000,000	...	100	103
Mutual	5,000,000	100	74	78
" Bonds, gold.	900.000	1000	—	105
Municipal	1,000,000	100	95	100
New York	4,000,000	100	90	95
Suburban, W'steh'str	390,000	50	—	100
Gas Co.'s of Brooklyn.				
Brooklyn	2,000,000	25	130	140
Citizens	1,200,000	20	70	—
" Scrip	220,000	1000	95	97½
Peoples	1,000,000	10	10	20
" Bonds	$ 325,000	...	—	95
" Scrip	300,000	...	75	80
Metropolitan	1,000,000	100	—	65
Nassau	1,000,000	25	—	78
" Ctfs.	700,000	1000	96	98
Williamsburgh	1,000,000	50	75	81
" Scrip		...	95	97
Kings Co	200,000	100	80	90
Union Co. E N. Y.		25	—	50
Richmond Co., S. I.	300,000	...	80	90
Out of Town Gas Companies.				
Bath, Maine	70,000	100		
Buffalo Mutual, N. Y	750,000	100	65	70
" Bonds	200,000	1000	95	100
Baltimore, Md	2,000,000	100	134	134
" Ctfs., gold	1,000,000		106	110
Bayonne, N. J		100		90
Brockport, N. Y	25,000	100	...	80
Citizens, Newark	918,000	50	105	108
Chicago Gas Co., Ills			150	
" " Bds.	124,000	—	105	107
Cincinnati G & C Co				190
Derby of Conn	160,000	100	60	80
East Boston, Mass.		25	132	—
Elizabethtown, N. J.	300,000	20	—	130
Fort Wayne, Ind		100	...	—
Hannibal, Mo	100,000	100	95	100
Hartford, Conn	700,000	25	184	186
Hempstead, L I.	25,000	100	...	—
Jersey City	386,000	20	155	160
Jamaica, L. I.	25,000	100	...	—
Jacksonville, Ill	120,000	50	82	...
Lewistown Maine	400,000	100	70	80
Lima, Ohio,	60,000	100	—	...
Bonds	30,000		90	
Laclede St Louis Mo.	1,200,000	100	100	110
Long Branch		20	40	50
New Haven, Conn		25	160	—
Peoples, Jersey City		...	106	110
Peoples of Albany	650,000	100	10	17
" Bonds	350,000	1000	—	-
Peoples of Baltimore		25	51	52
" Bonds			106	—
Plainfield, N. J	80,000	100	—	105
Perth Amboy		25	—	95
Rochester. N. Y.		100	50	60
Woonsocket, R. I.	150,000	100	95	...
Halifax N. S.	400,000	40	148	150
Hamilton, Ontario	150,000	40	117½	
San Francisco Gas-Co., S. Fr'isco Cal.			93	94
St. Louis, Missouri	600,000	50	73	75
Stillwater, Minn	50,000	50	—	26
Saugerties, N. Y	15,000	100	95	100
Troy, Citizens	600,000	100	—	60
Toledo, Ohio			95	97
Washington, D. C.		20	230	240

Duffee's Improved Gas Screen.



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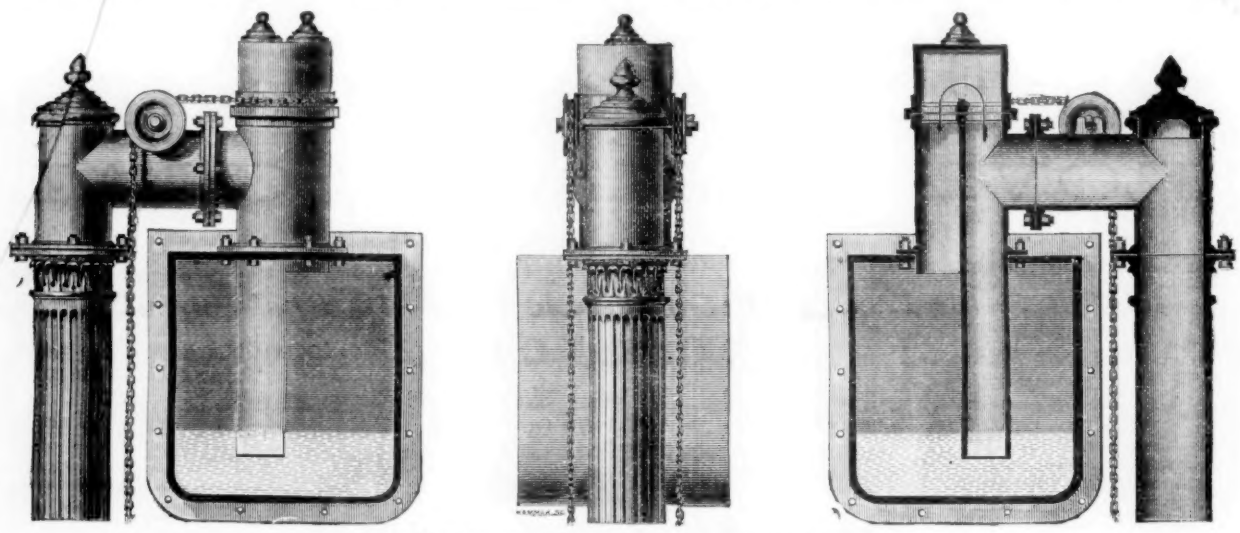

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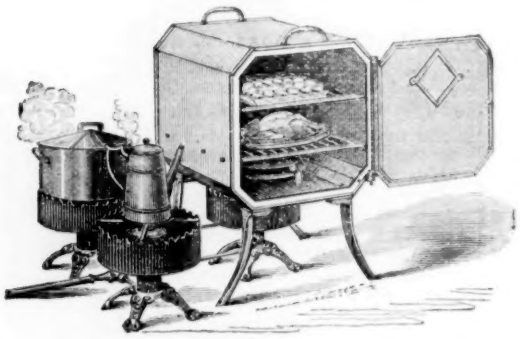

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351-1y

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224-1y n

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Mines in Harrison County, West Virginia.
Wharves Locust Point, } Baltimore.
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Among the consumers of Despard Coal, we name: Manhattan Gas Light Company, New York; Metropolitan Gas Light Company, New York; Jersey City Gas Light Company, N. J.; Washington Gas Light Company; Portland Gas Light Company, Maine

*** Reference to them is requested. 204-1

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This Company is prepared to supply any amount of their
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Either partner is authorized to sign the name of the firm in liquidation.

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New York, Aug. 1st., 1878. } F. SEAVERNS, JR. }

The business of the late firm of *PERKINS & JOB*, in *BOSTON*, will be continued by the undersigned under the style of *DANIEL W. JOB & CO.*

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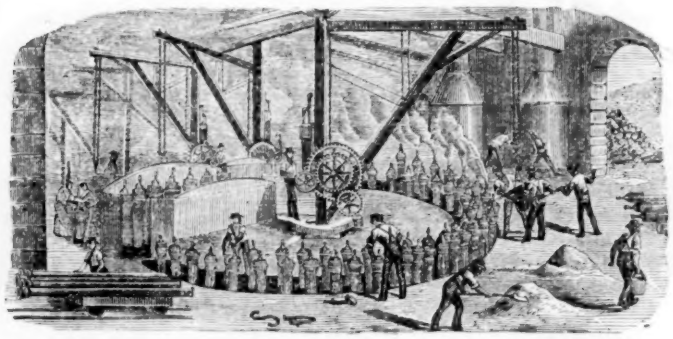

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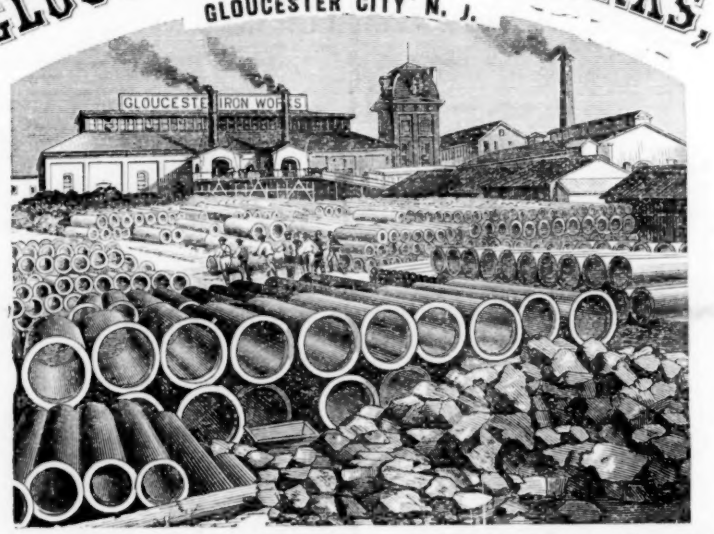

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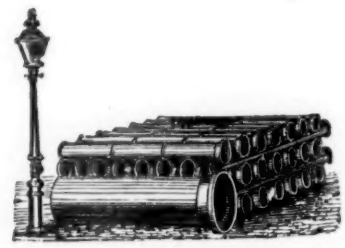

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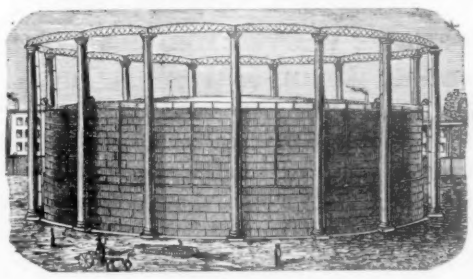

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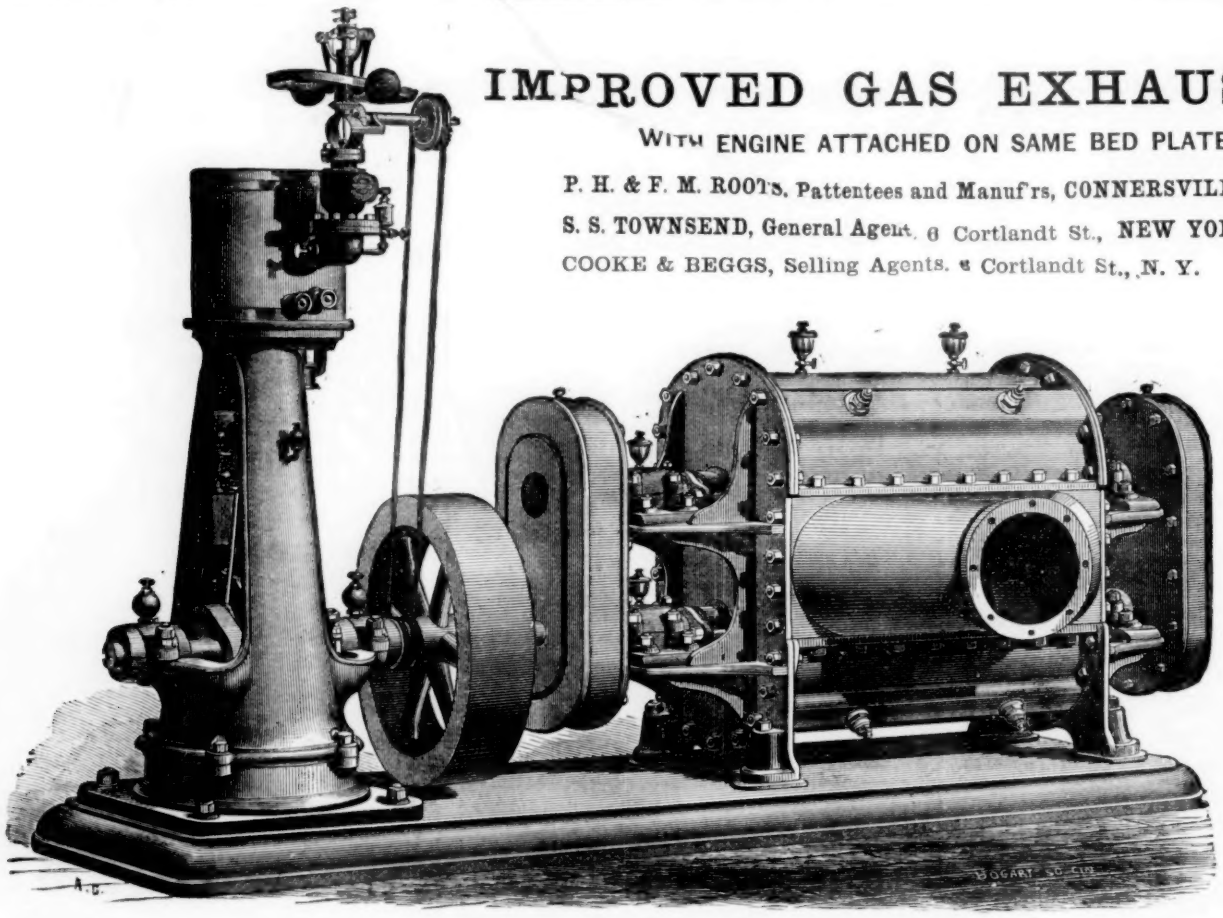

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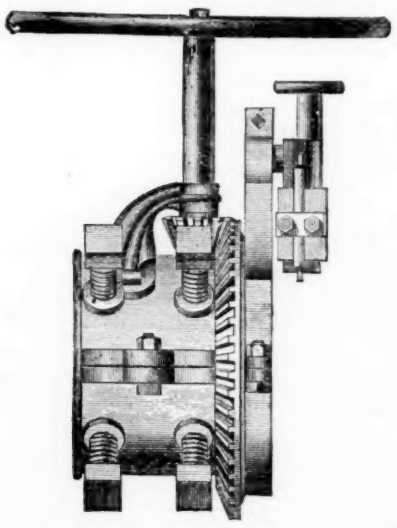

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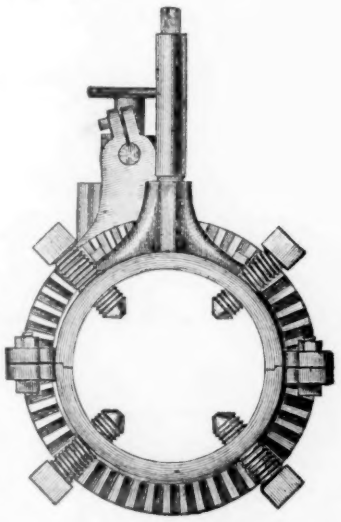

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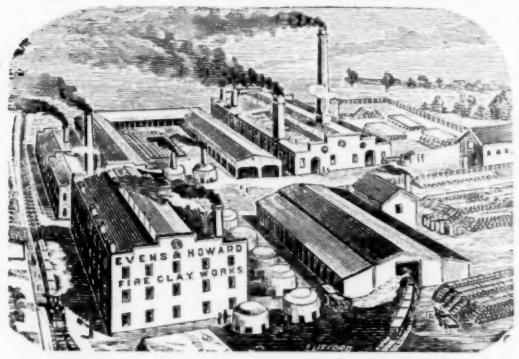

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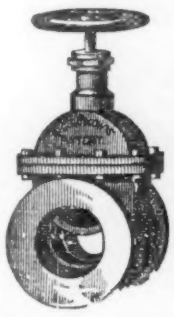

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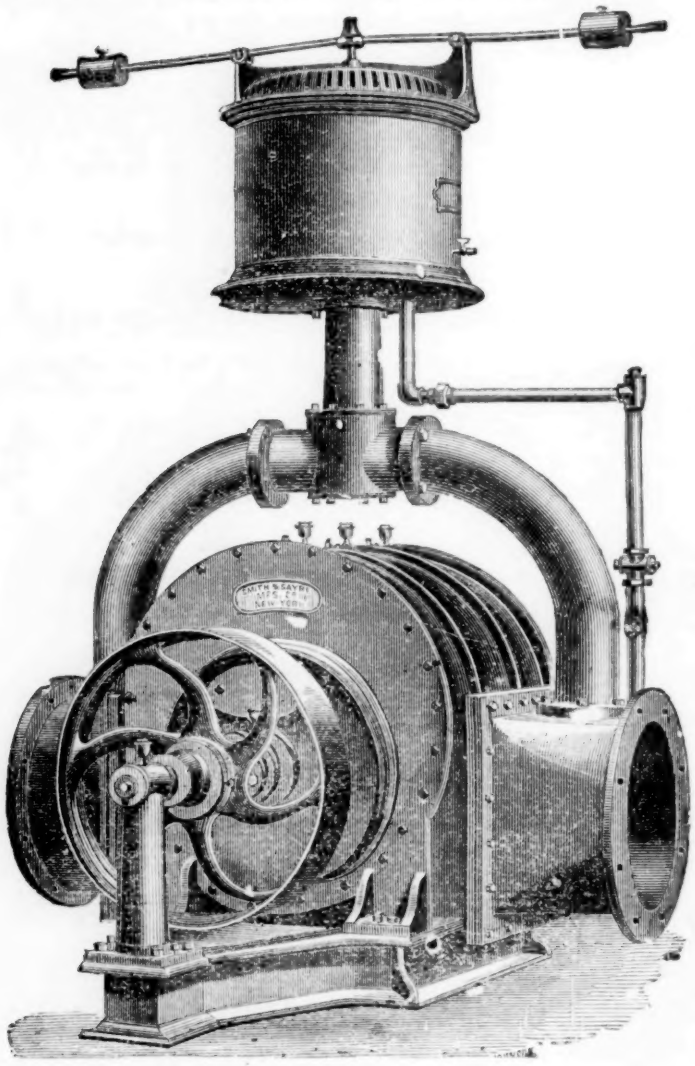

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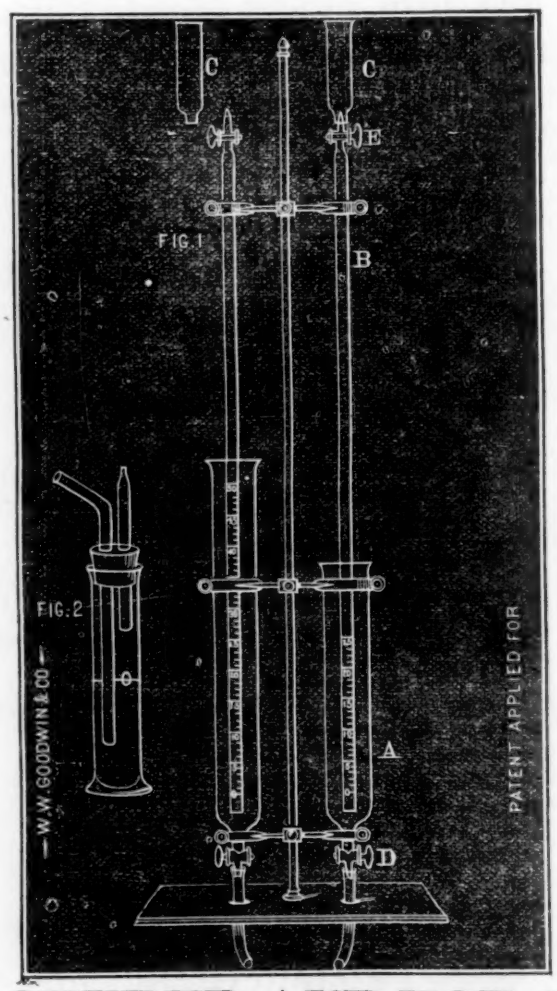

The apparatus will determine the presence of the following gases, and their quantity:

Ammonia	(NH^3)
Sulp. Hydrogen	(H^2S)
Carbonic Acid	(CO^2)
Air, Oxygen and Nitrogen.	
Bisulp. of Carb.	(CS^2)
Olefiant Gas	(C^2H^4)
Carbonic Oxide	(CO)
Light Carburetted Hydrogen	(CH^4)
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